NOV 16 1938

JOURNAL
of the
Association of American Medical Colleges

Volume 13 NOVEMBER, 1938 Number 6

CONTENTS

The Fundamentals of Psychiatry as Applied to Medical Education 353
Robert E. Britt, M.D.

Teaching of Medical Economics to Undergraduate Medical Students 359
Kingsley Roberts, M.D. and Michael M. Davis, Ph.D.

The Autonomic Nervous System: Morphologic and Functional Considerations for the Medical Student 363
Charles F. De Garis

A Study of the Predictive Value of the Medical Aptitude Test at Vanderbilt School of Medicine 380
Beverly Douglas

History of Medical Education. The First Graded Curriculum 391
Fred C. Zapffe

Chemical Psychiatry 394
Editorials 395
College News 401
General News 406
Book News 410
Index 411

ESSENTIAL for STUDENTS

American Illustrated Medical Dictionary

Completely Revised for the New (18th) Edition

See SAUNDERS ADVERTISEMENT — *just inside*

ASSOCIATION OF AMERICAN MEDICAL COLLEGES

OFFICERS FOR 1938-1939

President: WILLARD C. RAPPLEYE, New York City
President-Elect: RUSSELL H. OPPENHEIMER, Atlanta, Georgia
Vice-President: WALLER S. LEATHERS, Nashville, Tenn.
Secretary: FRED C. ZAPFFE, Chicago, Illinois
Treasurer: A. C. BACHMEYER, Chicago, Illinois

EXECUTIVE COUNCIL

MAURICE H. REES, Chairman, Denver; LOREN R. CHANDLER, San Francisco; JOHN P. BOWLER, Hanover, N. H.; STANHOPE BAYNE-JONES, New Haven, Conn.; W. C. RAPPLEYE, New York City; R. H. OPPENHEIMER, Atlanta, Georgia; WALLER S. LEATHERS, Nashville; ALAN M. CHESNEY, Baltimore.

MEMBERS

Alabama

University of Alabama, School of Medicine, University.

California

College of Medical Evangelists, Loma Linda and Los Angeles.
Stanford University School of Medicine, San Francisco and Stanford University.
University of California Medical School, San Francisco and Berkeley.
University of Southern California School of Medicine, Los Angeles.

Canada

Dalhousie University Faculty of Medicine, Halifax, N. S.
McGill University Faculty of Medicine, Montreal.
Queen's University Faculty of Medicine, Kingston.
University of Alberta Faculty of Medicine, Edmonton.
University of Manitoba Faculty of Medicine, Winnipeg.
University of Toronto Faculty of Medicine, Toronto.
University of Western Ontario Medical School, London.

Colorado

University of Colorado School of Medicine, Denver.

Connecticut

Yale University School of Medicine, New Haven.

District of Columbia

George Washington University School of Medicine, Washington.
Georgetown University School of Medicine, Washington.
Howard University College of Medicine, Washington.

Georgia

Emory University School of Medicine, Atlanta.
University of Georgia School of Medicine, Augusta.

Illinois

Loyola University School of Medicine, Chicago.
Northwestern University Medical School, Chicago.
University of Chicago Medical Schools, Chicago.
University of Illinois College of Medicine, Chicago.

Indiana

Indiana University School of Medicine, Bloomington and Indianapolis.

Iowa

State University of Iowa College of Medicine, Iowa City.

Kansas

University of Kansas School of Medicine, Lawrence and Rosedale.

Kentucky

University of Louisville School of Medicine, Louisville.

Louisiana

Louisiana State University School of Medicine, New Orleans.
Tulane University of Louisiana School of Medicine, New Orleans.

Maryland

Johns Hopkins University School of Medicine, Baltimore.
University of Maryland School of Medicine, Baltimore.

Continued on Third Cover Page

Published bimonthly, January, March, May, July, September and November, at 5 South Wabash Avenue, Chicago, Illinois, by the Association of American Medical Colleges. Subscription price $3.00 per year. Single copies, 75 cents.

Entered as second class matter January 17, 1930, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879.

(Continuing the Bulletin of the Association of American Medical Colleges)

JOURNAL
OF THE
Association of American Medical Colleges

Volume 13 NOVEMBER, 1938 Number 6

The Fundamentals of Psychiatry as Applied to Medical Education

ROBERT E. BRITT, M.D.
Instructor in Psychiatry, St. Louis University School of Medicine, St. Louis, Missouri

To those of us engaged in the teaching of medical students, many problems arise which concern us directly as to how we can serve best in our capacity as teachers, and discharge to our best ability our duties to train young men as physicians. This problem concerns psychiatry at the present time as it never did before because the importance of the relationship between body and mind has received the attention of medical educators to the point where the study of mental and nervous diseases is considered fundamental to the proper training of students and is considered of equal importance to the branches of medicine, surgery, obstetrics, and pediatrics. This emphasis has certainly changed psychiatry's status from that of the narrow limited specialty it had been in the past.

Nervous and mental disorders of one sort or another have been recognized since the days of antiquity and their causes and symptoms were oftentimes mixed with the superstitious beliefs of the day. There were, however, many members of the medical profession at that time who looked upon them as the result of upset physiology and treated them accordingly. It was an unfortunate situation that led to the division of ideas concerning mental diseases at the time when the physician decided that physical and mental states were in no way related to one another and that mental attitudes had no place in medical practice. However, there were many among the generations preceding and following this division into the purely physical in which the doctor appropriated to himself the body and allowed the handling of altered conditions of the mind to whoever wanted them who recognized the need one for the other. Psychiatrists saw this need and were more openly aware of the fact that a firm grounding in the fundamental principles of medicine was necessary, whereas the physicians for the most part were more content to look upon the art of medicine as a thing to be acquired, but not teachable as a science.

Since this division took place developments have occurred throughout the medical field. New specialties have taken form and others more elaborately developed. Similar changes have also taken place within the psychiatric field, although as a whole with no apparent relationship to developments which concerned the rest of medicine. Clinical and laboratory methods achieved a high

degree of scientific perfection, but less and less attention was paid to the individual himself. There is, however, a growing recognition at the present time that the individual patient is himself a being to be reckoned with entirely independent of his physiological responses in the treatment of his disease. With this in mind it can be seen that the physician and the psychiatrist have similar aims, that they perform comparable medical services and that they require similar training. The return of psychiatry to medicine is, therefore, somewhat like the return of a prodigal son who left home by mutual consent, but who returned there by universal demand.

The recognition of psychiatry's importance in medicine has naturally presented it a rare opportunity in the education of medical students. It is true that psychiatry is a specialty and that there will always be the need for the specialist, but there is much of common interest to both psychiatry and general medicine that can be utilized by each.

As to how psychiatry should be taught and what should be included in its wider scope are now subjects which are receiving serious consideration. As psychiatry has been presented in most instances in the past the courses have consisted chiefly in lectures describing the various types of insanity and illustrated where facilities were available by demonstrations of material from local hospitals for the insane. These lectures and demonstrations no doubt gave the student a general idea as to what psychotic patients looked like and how they acted. It is doubtful whether or not the rank and file of the medical students were materially helped by these demonstrations, although, it is conceivable that those students who already had psychiatry in mind as a future specialty might find a great deal of interest in them.

In the analysis of the subject matter of any course of the medical curriculum can be found a great mass of data concerning that particular course. Let us consider otolaryngology for instance. In this specialty the students' lectures cover a wide variety of topics within the field beginning with the mild affections of the upper respiratory tract and their treatment. Carrying their instruction a little further they are shown or have demonstrated to them the various surgical procedures involved in the same areas: the removal of tonsils and adenoids, operative procedures affecting the various sinuses and diseases of the mastoid, finally ending with a demonstration in which a bronchoscopist may show them how the lower respiratory passages are explored for diagnostic purposes or the removal of foreign bodies. Out of this variety of material the student is able to formulate for himself the fundamentals of this course in such a way that he can apply them to the situation of the future which he will encounter in which a knowledge of this particular specialty is required. He will find this to be the case in each and every specialty and when this entire mass of fundamentals is taken in its entirety and its interrelationships recognized he will find that he has mastered to a greater or lesser degree the fundamentals of medical practice.

Psychiatry as it has been taught deals chiefly with end results. The museum

specimens shown the students are interesting indeed to observe and they are no doubt keenly interested (sometimes amused) by what they see, but they do not have an opportunity to learn what fundamental facts are responsible in one case for a reaction type known as schizophrenia and in another of manic depressive psychoses. Yet it is the knowledge of these facts which is helpful, not only to the psychiatrist, but to the general practitioner as well and as such should be stressed in the teaching of medical students. It is a granted fact that insane patients were at one time free to walk the streets and probably showed no unusual characteristics other than those of the normal citizen, yet as time passed changes occurred in some of these individuals which necessitated a change in status from sanity to insanity. It would be quite important, therefore, if the insidious changes responsible for these later misfortunes could be recognized day by day so that preventive measures could be applied in time to prevent the eventual calamity.

For this reason it is important that psychiatry be presented in a fundamental way to medical students. In some schools this is being done with a certain amount of success by courses dealing with the normal personality which are known as "psychobiology." The importance of such a course cannot be overemphasized because if conscientiously presented to the students and adequately understood by them they would have a practical grasp not only of psychiatric principles, but a good understanding of the relationship which exists between body and mind and the relationship of one's mental attitude to disease in general.

Courses in psychobiology deal with personality as a whole, but in this sense we do not refer to any particular quality of the individual, but more to the sum total of all of his qualities, mental, physical, hereditary, acquired through training as well as those influenced by his experiences throughout his entire life to the very present moment. Variations in the individual's physical and mental make-up as a result of structural differences either through heredity or modifications from developmental anomalies are considered. Variations in intellectual endowment are equally important as well as to how the personality as a whole has reacted to various situations during life. The relationship which exists between physical type and personality type and many other pertinent facts are considered which enable the student to know not only what is meant by the normal personality, but what its possible limitations might be in health and disease.

If such a course were well presented and adequately understood the following facts would make themselves clear:

1. Definite personality types can be recognized which carry their own potentialities in health and disease.

It has been observed that in the course and development of the various psychoses such as manic depressive insanity, schizophrenia, and paranoia that the pathological trend seemed to occur in each instance in individuals with certain personality characteristics. The type of personality in which manic depressive insanity is likely to occur is one in which the individual is subject to

rather wide variations in mood, from a relative increase in bodily and psychomotor activity to those of depression and psychomotor retardation. The schizoid personality on the other hand is usually characterized by a tendency on the part of the individual to remain somewhat aloof from his environment, and does not readily come to a successful agreement with his surroundings, consequently he is driven to seek an arbitration with his conflicts through the ruminations of his own mind, which in noteworthy instances produces a marked distortion of his thought processes as well as his perspective of the entire world. The paranoid personality is one in which the individual is rather quick to divine the possibilities of some hidden meaning to many of the incidents which occur during the ordinary course of events which he is quick to interpret in terms of slight offenses of one kind or another. This phenomenon may become more marked to the point that he may feel as though he is the victim of a rather complicated series of persecutions.

All three of these personality types are readily recognized and the factors which constitute them can be seen in the great mass of the population as a whole, although they never require the help of a psychiatrist for mental difficulty. In the pathological state, therefore, there is apparently a misuse or a misdirection of some so-called normal characteristic to the point wherein it is emphasized to a degree far beyond its normal limits.

2. There are occasional noteworthy instances wherein there exists a definite relationship between physical or bodily type, and personality type.

Kretschmer called attention to the fact that in the psychoses of functional origin, namely schizophrenia and manic depressive insanity, these disorders occurred with considerable frequency in persons of a certain physical type. He described his Pyknic type in which the individual tended toward corpulence, short bodies and of heavy build. Kretschmer noted a rather high incidence of manic depressive insanity among individuals of this type. He also described asthenic and athletic types of physical build. The asthenic individual is described as being rather light in build, flat chested, small boned, tending to give an elongated appearance so that he often appears taller than he actually is. The athletic type is described as having but a small deposit of fat throughout the body, being of a good muscular and boney development with a tendency toward broad shoulders and narrow hips. Kretschmer noted that a considerable number of his schizophrenic patients occurred among these so-called asthenic and athletic types.

There are, however, noteworthy instances in which the psychosis and physical type do not coincide with Kretschmer's studies, although they do occur frequently enough that one might bear the relationship of physical type to personality type in mind.

Other instances are given wherein these same physical types carry their own potentialities regarding physical disease. This work was reported in 1915 by Goldthwaite and Bryant in the Boston Medical and Surgical Journal as "The Anatomic and Mechanistic Conception of Disease." The work of W. W.

Graves of St. Louis on "The Relationship of Scapular Type to Longevity by the Age, Incidence, Principle of Investigation," is likewise interesting from the same point of view.

3. Personality development and maturity is influenced greatly by variations in intellectual and emotional endowment.

Ordinarily intellectual and emotional endowment develop at a fairly definite rate, although we know that full maturity is never completely attained. Instances occur in which individuals with a relatively high level of intelligence do not attain the level of worldly success one would expect of them. This is often shown to be the result of infantile emotional tendencies which have persisted into adult life. Noteworthy examples of this are to be found in the so-called constitutional psychopathic states.

4. Certain attitudes develop from the interaction of the personality as a whole with the environment and modify any disease process physical or mental.

In this regard we often see patients who may or may not be physically ill, but who have developed certain attitudes during life that exert a crippling affect upon them so that they are not always quite able to reach a satisfactory adjustment between themselves and the rest of the world.

This is best illustrated by the case of a girl 25 years of age who had been treated in the outpatient department over a two-year period for dysmenorrhea. During this time her attitude of hopelessness toward her physical condition rendered a thorough investigation of her past life necessary. Her early history was characterized by much emotional turmoil in her home. Her father was a chronic alcoholic who was continually deserting and returning to his family, consisting of the patient, her mother and himself. During one of his wandering escapades he contracted syphilis, and infected his wife on his return. He thereafter deserted again and has not returned since. Meanwhile, the luetic infection of the patient's mother progressed due to inadequate treatment to the point where definite evidences of tabes with a primary optic atrophy developed.

The patient herself had attempted to study nursing, but she was so unstable that she could not continue. She tended to tell everyone about the tragic events of her past life and she was advised by the hospital that she was unsuited for a nursing career.

The point to be borne in mind in this particular case is that any and all types of medical therapy did not seem to have any lasting effect upon her physical or mental outlook on life. It is also noteworthy to add that during her entire attendance at the clinic she saw the psychiatrist less than a half dozen times. The complaints themselves were essentially along other lines. However, her treatment regardless in what department is was carried out necessitated a thorough knowledge of her past history, her personality type and the attitudes that had been fostered in her during this time.

With the understanding of these facts and the ability to give them proper application it is doubtful whether or not more intensive training in psychiatry

would really be a necessity for the student. However, in order to crystalize these facts a little more their application to actual psychiatric problems would be of value. For practical purposes one can consider two types of psychiatry, minor psychiatry and major psychiatry. By minor psychiatry we refer to the minor reaction types of mental diseases such as the psychoneuroses which embrace the anxiety states, hysterical and hysteroid reactions, the obsessive compulsive neuroses, neurasthenia, psychoasthenia, constitutional psychopathic states as well as the many peculiar so-called psychoneurotic phenomena which are found associated with definite physical diseases. Situations of this kind are very common in the general practice of medicine and it has been estimated that they can be found in 40 per cent to 60 per cent of general medical practice.

Major psychiatry on the other hand involves all of the more severe reactions in which the individual as a whole is seriously upset mentally and in most instances requires observation in an asylum.

All of these reactions are due to definite disturbances in personality function and are thoroughly understandable if one is acquainted with personality organization. This does not imply that the student is expected to become entangled in the details of psychiatry as a specialty in order to practice medicine, but being acquainted with these facts he will have extracted the practical good from this course in a way which might be compared for instance to the example given above in the course of otolaryngology. It is true that in this course the technique and theory of the most delicate operations on the respiratory passages were considered. However, by being able to satisfactorily treat some of the minor ailments of the ear, nose and throat and perhaps be able to remove tonsils and adenoids with a fair degree of ease gives him a definite use and application for his course in otolaryngology without necessarily making of him a specialist in this field.

Likewise a knowledge of personality types and their potentialities in disease might be somewhat aptly referred to as "The Tonsils and Adenoids" of psychiatry, or those fundamentals which the student can extract from this course and which he can add to all of his other fundamentals of medical practice for the mutual benefit of all.

The comparison used in this discussion wherein the author refers to the specific instance of nose and throat operations is not intended to reflect upon the otolaryngologist in any way and is purely incidental. He merely intends to emphasize the fact that certain phases of any specialized field are part of the general practice of medicine, they always have been and they always will be and they do not in any way minimize the importance of the specialists in those fields.

Teaching of Medical Economics to Undergraduate Medical Students

KINGSLEY ROBERTS, M.D. and MICHAEL M. DAVIS, Ph.D.
New York City

During recent years the subject of medical economics has been drawn into the limelight as a matter of practical interest to physicians and as an area of considerable controversy. The subject, however, includes facts and ideas as well as opinions. One of the questions under discussion in medical schools has been whether the subject should be taught to undergraduate medical students and, if so, how much and how. In view of the interest in these questions, the author wrote personally to the deans of all the medical schools in the United States and Canada, inquiring whether they were teaching medical economics to undergraduates. To those who responded affirmatively, an additional personal letter was sent, asking regarding the scope and content of the course. This article summarizes the information thus gathered.

Of 64 medical schools[1] replying, 27, or about 40 per cent, stated that they gave no attention to the subject, and one college stated its intention to reduce the work which it has been offering for a few years. On the other hand, two schools stated they had not been offering work in medical economics, but expected to do so next year. Fifteen schools are offering a few lectures on the subject. Thus, one dean writes, "We do not have a special course on medical economics, but I give several lectures on that subject to the senior class. I feel that this subject should have more extended attention." Another dean declares that, while no course is offered, "the general topics of medical economics and the social and historical backgrounds of medicine are under constant informal discussion in the school." Another school invites three members of its faculty to give one or more lectures on the subject. Some of these relate to the doctor's office and business methods, collections, office records. Other lectures are on the medical care of the indigent, relation to community agencies, workmen's compensation service. Another school reports that, while they have no "course" in medical economics, "the economic aspect of certain medical situations is frequently mentioned to students in the course of lectures and clinics" and that there is a discussion group of students which frequently takes up subjects in this field. This is typical of several other schools.

Another type among these fifteen schools is represented by one which offers extracurricular lectures to the students. These deal with allied professions—dentistry, public health, pharmacy, nursing—with relations between physicians and hospitals and with the social and economic relations of medicine in general. At this and at another school the subjects are presented by members of the pro-

1. There are 76 medical schools in the United States and Canada giving a four years' course. As will be seen, five-sixths of these furnished information. The response from one school was too vague to tabulate so that only 63 appear in the analysis in the text.

fessions concerned and by a member of the sociology department of the university.

A third group includes six schools. They are offering a more or less systematic course which, while usually entitled "Medical Economics," is almost entirely vocational; that is, it deals with the business organization of a doctor's office, the "elements of success in practice," and such problems as choosing a location, entering into a partnership, buying a practice, setting fees, bookkeeping, investments and collections. The use of the book by Mr. Theodore Wiprud, "The Business Side of Medical Practice," is mentioned by two of these schools.

Eight schools report a more systematic course than any of the preceding, dealing with medical economics in the broader sense of the term; i.e., the economic and social relations of medical services. The topics included in some of these "courses" do not show systematic organization of material. They are rather a series of lectures on various, sometimes diverse, phases of the general subject. At one of these schools, one physician gives the whole course under the title, "Medical Economics and Medical Ethics." He states that he covers:

The Principles of Ethics; Group Practice, its advantages and disadvantages; Foundations, their function, advantages and abuse; Hospital Insurance; Group Hospital Insurance; the advantage, if any, to the subscriber, the hospital and the disadvantage to the physician.

Socialized Medicine; Compulsory Health Insurance; Corporation Medicine; Boards of Health; State Welfare; State Medicine; The Cost of Medical Care; The systems operated in foreign countries under the present social systems, their effect on the profession, preventive medicine and the lowering of the standard of medical care under such systems.

Another school reports the following topics, given by different speakers:

Opening Up An Office; Reasons Why A Young Physician Should Locate in a Small Urban City; Opportunities in Public Health; Care of the Patient; Consultations; Malpractice, especially in relation to Care of Fractures; Sex Hygiene.

Contract Practice; Economic Considerations for the Young Practitioners in Small Communities; Medical Care of the Indigent Sick; How to Avoid Malpractices; Value of Membership in County Medical Societies; Some of the Problems that the Young Physician Encounters.

European Medicine with Special Comments on the Russian Situation; Economic Aspects of Medical Practice; Post Graduate Study for the Medical Practitioner; It's Fun to Practice Medicine; Problems that Face the Young Surgeon; Medical Aspects of Life Insurance; Medical Licensure; Medical Aspects of State Social Security Acts; Summary of Types of Medical Practice.

A third school of this group lists the subject as follows:

The Economic Aspects of the Practice of Medicine (three speakers, representing different points of view); Some Thoughts of the Practice of Medicine; Choosing an Internship; Analysis of the Report of the Committee on the Costs of Medical Care (by two student speakers) Medicine and the Social Sciences; Malpractice and Malpractise Suits; Birth Control and Obstetrical Care.

Social and Economic Aspects of Tuberculosis; Research Opportunities in Medicine; Internships; Social and Economic Aspects of Syphilis Control; Socio-Economic Aspects of Birth Control; Medical Compensation.

Three of these eight schools report that they are following closely the "Outline for a Course in Medical Economics," prepared by the Bureau of Medical Economics of the American Medical Association and published in the Journal of the A.M.A., February 6, 1937.

A final group of four schools have systematic courses worked out by members of their faculty. In one of these schools a professor offers a course in the social aspects of medicine running through a full quarter. In addition, a seminar and discussion groups for advanced students are held. These are all elective courses. The second of these schools includes in the course, which is given by a single faculty member, the following subjects:

Difference Between State Medicine and Health Insurance; Historical Background of Medical and Hospital Services from Napoleonic Wars; Industrialism, Advance of Medicine and Increased Cost; Reasons for High Cost of Medical Care; Emotional Element in Seeking Medical Care; Public Opinions and Points of View Regarding Medical Economics; Description of Health Insurance in Great Britain; Description of State Medicine in Russia.

The third school offers a systematic course under the title of "Professional Conduct and Medical Economics." This is also given by one member of the faculty, and covers the following subjects:

Medical Education and the Student's Personality; The Young Practitioner; Where to Start Practice; Investigators and Practitioners; Advertising and Salesmanship; Opportunities for Young Doctors; Specialization; The Layman and the Young Practitioner; Status of Women M.D.'s.

Medical Ethics; Consultations; Referring Patients; Substituting; Organized Medicine; Physician and Druggist; Physician and Nurse; Birth Control; Abortion; Eugenic Sterilization; Euthanasia; Quackery, Fads and Cults; "Legitimate Quackery."

The Art of Medical Practice; Medical Economics: Statistics on Costs of Medical Care; Physician's Fees; Pay Clinics and Middle Class Patients; Free Clinics and Poor Patients; Higher Fees; Fee-Splitting; Getting Bills Paid; Difficult Collections; The Free List; Our Present Industrial Medicine and Contract Practice.

Six Essentials for Any Plan Providing Medical Service; Recommendations of the Majority and Minority Groups of the Committee on the Costs of Medical Care; Recommendations of the American Medical Association; Medical Society Plans in the U.S.A.; Municipal Doctor System in Rural Saskatchewan; English System; German System; Sweden; France; Russia.

The course at the fourth school is described in a letter as follows:

"The topics that are considered include the interrelationships of medical sciences and the social sciences, with particular reference to sociology, economics, and political science. In order to construct a firm background for the latter discussions the students are acquainted with the history and evolution of the industrial system and the impact of this system upon the distribution of medical care.

Following the above preliminary considerations the question of medical facilities is considered. This is followed by a discussion of the problems of medical needs of the population, and this subject in turn leads to the consideration of population income, including professional income. From here, material concerning methods of solving the problems of medical care are considered. Attention is given to the many programs and devices that have been adopted or are being tried out in the United States, as well as solutions offered by the experience in other countries."

SUMMARY

1. Some attention is given to the subject of medical economics at approximately half of the medical schools in the United States and Canada.

2. Attention to the subject is increasing.

3. A limited number of schools give courses of a substantial character under the responsible direction of a member of the faculty.

4. In a larger number of schools the "course" consists of a series of lectures by various persons, the topics often being scattering and more or less disconnected.

5. The physician's personal economics in private practice is dealt with more or less systematically in a few schools and appears as part of the lectures on "medical economics" at other schools.

6. Members of the economic and sociologic faculties of the universities are brought in to deal with certain phases of medical economics at a few schools.

The Autonomic Nervous System: Morphologic and Functional Considerations for the Medical Student

CHARLES F. DE GARIS

Professor of Anatomy, University of Oklahoma School of Medicine, Oklahoma City, Oklahoma

The portion of the nervous system to be discussed here has gone under one alias after another at different periods, doubtless because, like people who assume names, its character has been rather questionable and its function in the human economy has been open to a number of interpretations. Thus it has been termed involuntary, sympathetic, ganglionic, organic, vegetative, visceral and autonomic.

One of the oldest and most widely used of these names is sympathetic—a designation employed by Winslow in 1732. He taught that the various sympathies of the body, meaning the various interactions of the viscera, were conveyed and regulated by the chain of ganglia, and he spoke of this chain as the greater sympathetic. Recognizing that the vagus also had something to do with this exchange of sympathies, he called the vagus the lesser sympathetic.

Johnstone, in 1764, taught that voluntary impulses were converted into involuntary by passage through the chain ganglia; therefore he termed the involuntary nerves ganglionic. Bichat, in 1800, introduced the term vegetative nervous system, as being that system which controls the purely vegetative and reproductive functions, these in contrast to the animal or locomotor functions. Bichat's term has its modern counterpart in *Die Lebensnerven,* the title of a treatise by Mueller (1924), which, in truth, is one of the best brief accounts we have at present.

Gaskell, between 1886 and 1889, made important contributions to our knowledge of the vegetative, or what he called the visceral nervous system. From morphologic studies he showed that a number of cranial nerves carry visceral fibers; he also demonstrated that not only all the thoracic but also some of the sacral nerves carry such fibers. Thus, he pointed out that there are cranial, thoracic and sacral outflows of visceral impulses.

In 1889-1890 Langley and Dickinson discovered a new experimental method for analyzing the vegetative system. This was the now famous nicotin method with which the name of Langley is always associated. Essentially, this method depends on the fact that nicotin interrupts the synapse between one neuron and another, so that by applying a solution of this drug to various ganglia it was possible to locate precisely where a given synapse occurred. On the basis of the many clear-cut results obtained by this method, Langley advocated the term autonomic for the part of the nervous system he was studying. To quote from his brochure of 1921 (p. 6): "The word 'autonomic' does suggest a much greater degree of independence of the central nervous system than in fact exists, except, perhaps, in that part which is in the walls of the alimentary canal. But

it is, I think, more important that new words should be used for new ideas than that the words should be accurately descriptive."

As used by Langley, the term autonomic refers only to the effector (motor) part of the system, while other terms noted above, such as involuntary, visceral, vegetative and, most frequently used of all, sympathetic, do not explicitly exclude the receptor (sensory) part of the system. In the present discussion the autonomic nervous system will mean the entire receptor-effector system, whereby blood vessels and glands throughout the body and musculature of viscera are adjusted to various changes in physiological state of the organism or of its parts. The thoraco-lumbar autonomic system, as used here, is equivalent to the usual textbook sympathetic system; the cranio-sacral autonomic system is equivalent to the parasympathetic system.

THE THORACO-LUMBAR AUTONOMIC (SYMPATHETIC) SYSTEM

On either side of, and parallel to, the spinal column is a linear chain of ganglia strung, after the fashion of loosely threaded beads, on the sympathetic or commissural nerve trunk. The ground plan of this gangliated chain calls for one ganglion to each spinal nerve from first cervical downward through the spinal series to the coccygeal or last spinal nerve. This segmentation of the chain ganglia is well carried out except in the cervical region, where ganglia corresponding to the upper four cervical nerves (C I to IV) are fused to form the large spindle-shaped superior cervical ganglion; the ganglia for C V and VI form the middle cervical ganglion, and those for C VII and VIII form the inferior cervical ganglion. Below the level of the cervical region there is, as a rule, one autonomic ganglion to each spinal nerve. However, these ganglia vary in size, the largest usually being the first thoracic. This ganglion at times fuses with the inferior cervical; at other times, it forms with the second thoracic ganglion a branching mass somewhat resembling the conventional star pattern, whence its name stellate ganglion (usually found in the carnivora).

Thus far there is nothing in the above description to justify the restrictive term thoraco-lumbar. This term derives from the fact that the only part of the gangliated chain directly connected with the spinal cord is in the thoracic and upper lumbar regions. The thoracic and upper two or three lumbar spinal nerves carry sensory fibers into the spinal cord from outlying visceral regions; also they carry motor fibers from the spinal cord for ultimate distribution to smooth and cardiac muscles and glandular epithelium. Each of the thoracic and upper lumbar nerves is thus provided with a mixed (sensory-motor) connection for its corresponding chain ganglion. This connection is called a white ramus communicans (plural: rami communicantes), meaning, literally, a white communicating branch from spinal cord via spinal nerve to autonomic ganglion. Many, though not all, the fibers in a white remus are medullated; the preponderance of medullated fibers accounts for the glistening white appearance of these rami in fresh material.

In the thorax and abdomen, the autonomic system is represented not only by the segmental chain ganglia but also by large masses of ganglia and their con-

nections, which have been drawn to, or toward, the midline. These are especially abundant along the ventral aspect of the abdominal aorta, where they form dense plexuses within which lie collateral ganglia of the autonomic system. The largest ganglia of this type are the coeliac, one on either side of the coeliac artery at its origin. The aortico-renal ganglia are also of this type, and in a sense to be discussed later the chromaffin tissue of the suprarenal gland functions as a collateral autonomic center.

Finally, as the peripheral distributing mechanism of the thoraco-lumbar autonomic system, are the gray rami communicantes, whose fibers are for the most part nonmedullated and, therefore, in fresh material gray. There is one gray ramus communicans for each spinal nerve from first cervical throughout the spinal series to the coccygeal or last spinal nerve. Accordingly, except in the cervical region, there is a gray ramus passing from each autonomic ganglion to its corresponding spinal nerve. The superior cervical ganglion, being a fusion of four chain ganglia, gives off four gray rami, one to each cervical nerve from I to IV; the middle cervical ganglion, a fusion of two, gives off a gray ramus to each of the cervical nerves V and VI; the inferior cervical ganglion, again a fusion of two, gives off a gray ramus to each of the cervical nerves VII and VIII.

Considering the thoraco-lumbar autonomic system as a whole, it is seen from the above account that the outflow from spinal cord to autonomic ganglia has been interrupted in the cervical and lower lumbar-upper sacral regions; i.e., in these regions there are no white rami communicantes. It will be recalled that the cutaneous nerve supply of the trunk is also interrupted in these regions. Thus, the lowest cervical nerve supply of the skin of the trunk (at the clavicle) is C IV; immediately contiguous to and below it is the second thoracic nerve (T II). This means that cervical nerves V to VIII and thoracic I are not represented in the skin of the trunk at all (see Cunningham, p. 1025, f. 883). Likewise, at the pubis, the only lumbar nerve supplying the skin of the trunk is the first; directly contiguous to and below it is the second sacral nerve, which means that lumbar nerves II, III, IV and V and sacral nerve I are not represented in the skin supply of the trunk at all. Obviously, the nerve supply of the upper extremity has drawn off the lower four cervical nerves and first thoracic, resulting in interruption of the segmental skin supply of the upper trunk, just as the lower extremity has drawn off the lower four lumbar nerves and first sacral, resulting in interruption of the segmental skin supply of the lower trunk.

Apparently, somewhat the same thing has happened to the autonomic outflow from the spinal cord. In the whole cervical region, where the cervico-brachial plexus comes off, there are no white rami communicantes; likewise, where the largest part of the lower limb plexus comes off there are no white rami. Thus, it appears that the upper and lower extremities interrupt both the cutaneous nerve supply of the trunk and the autonomic outflow from the spinal cord. The significance of the autonomic interruption is not clear, nor do we

know what, if any, cranio-sacral autonomic supply is received by the extremities. Investigation is urgently needed on these questions, especially because of the importance and difficulty of denervating the limbs of their autonomic supply in the treatment of trophic disorders, such as Raynaud's gangrene.

To understand the functional significance of the thoraco-lumbar autonomic system, it is necessary to consider the reflex arc of this system in terms of neurons. This, in turn, is best accomplished by comparing the autonomic arc with the somatic arc. A general discussion of this latter and its relation to the central nervous system requires digression here.

To illustrate a simple somatic arc, let us take the genito-femoral nerve (lumbar nerves I and II), which supplies the cremaster muscle and a skin area of the upper medial part of the thigh. If the genito-femoral skin is stroked, the stimulus is carried by perpheral sensory fibers along lumbar nerves I and II to the dorsal root ganglia, where lie the cell bodies of the sensory neurons. The dorsal root ganglion is usually not regarded as a center of synapse; rather, it is merely an aggregate of unipolar sensory cell bodies, from which circumstance it is incorrect to speak of preganglionic and postganglionic neurons in reference to the root ganglion. The stimulus arising from stroking of the genito-femoral skin thus passes by way of the sensory neuron (No. 1) through the root ganglion into the posterior part of the spinal cord. There it forms a synapse with an intercalated neuron (No. 2), whose cell body and all its processes lie within the spinal cord. This neuron transmits the stimulus to the anterior part of the cord, where synapse is made with the motor neuron (No. 3), whose cell body lies in the anterior part of the cord and whose peripheral process (axon) passes out by way of the nongangliated ventral root to enter the mixed (sensory-motor) spinal nerve (genito-femoral) and thus reaches the cremaster muscle, with resulting contraction of this muscle. This cremaster reflex, whereby stroking of the genito-femoral skin causes contraction of the cremaster muscle, involves a typical somatic arc, comprising three neurons: (1) sensory to spinal cord; (2) intercalated within spinal cord; (3) motor from spinal cord to muscle. This arc has, for sake of illustration, been described in very simple terms. Perhaps no such uncomplicated arc exists in the mammalian nervous system, since not only do incoming sensory neurons send processes up and down the spinal cord, but also the interclated neuron may not be as simple as that described above. However, it is well to emphasize the fact that the receptor element of the arc, the sensory neuron (No. 1) and the effector element, the motor neuron (No. 3) are, as stated here, simple and single in each case.

So they are in any other case. Let us suppose, for further illustration, that not only does the cremaster muscle contract but also there is quickening of the breath in response to stroking of the genito-femoral skin. In this instance the single sensory neuron (No. 1) carries the stimulus into the cord as before. But now the intercalated neuron (No. 2) is amplified into an intercalated system of neurons, which carry the stimulus up to the respiratory center in the medulla, whence discharge is made into descending paths of the cord, where at appro-

priate levels synapses are made with motor neurons (No. 3) and by these the diaphragm and external intercostal muscles are activated with resulting inspiration. Even so, no matter how extensive the respiratory respone may be, each muscle fiber taking part in it is caused to contract by a single motor neuron. Thus it is seen that in this additional respiratory reflex the only part of the arc which has been at all elaborated is the intercalated system, i.e., the part entirely within the central nervous system itself. The sensory neuron (No. 1) and the motor neuron (No. 3) of the respiratory reflex are just as simple and single as in the case of the cremaster reflex.

A final example will illusrate the hierarchy of complexity in the intercalated system. Suppose that, given the same stroke of the genito-femoral skin and the same reactions detailed above, we have in addition the coming into consciousness of the stroke as a painful sensation with the voluntary initiation of avoiding activities. Again the single sensory neuron carries the stimulus into the spinal cord, but once discharged into the intercalated system, the path of the stimulus covers a vastly amplified arrangement of neurons involving the cerebral cortex itself, where, among other things, consciousness or awareness of the pain results, and where both instinctive and judgmental responses may be initiated and transmitted down the cerebrospinal axis to appropriate levels for carrying out the desired avoiding activities. These activities may call for contraction of many groups of muscles, but even so, the motor neuron distributed to each muscle fiber is simple and single, as in the cremaster reflex arc.

Thus it is seen that no matter what sensation we receive (except from the retina) and no matter what responses we make to given sensations, the receptor or sensory neuron (No. 1) and the effector or motor neuron (No. 3) are in all cases simple and single. Their entering the spinal cord and brain at various levels and their coming out at the same or other levels do not invalidate this statement. Therefore, what we have referred to as the hierarchy of complexity in response is strictly and solely the business of the system of neurons intercalated between the single receptor or sensory neuron (No. 1) and the single effector or motor neuron (No. 3). It is also apparent that this system of intercalated neurons is, in fact, the cerebrospinal axis, or central nervous system itself. The central nervous system contains, in addition to the elaboration of intercalated neurons, the terminations of sensory neurons (No. 1) and the cell-bodies of motor neurons (No. 3).

Bearing in mind this brief general statement of the somatic arc and its relation to the central nervous system, we are now prepared to discuss in similar terms the autonomic arc. Let us start with a visceral sensory stimulus, e.g., from the sensitive covering of the intestine, the peritoneum. This stimulus is carried by the fiber of a sensory neuron (No. 1) which passes through the coeliac ganglion without synapse, is incorporated in the greater splanchnic nerve and reaches a chain ganglion, through which it passes without synapse to reach the white ramus communicans corresponding to this chain ganglion. By way of the white ramus the fiber enters the spinal nerve and passes into the dorsal

root; in the dorsal root ganglion lies the cell body of this fiber (sensory neuron No. 1), whence the central process of this neuron enters the spinal cord. Thus the visceral sensory neuron (No. 1) is comparable to the somatic sensory neuron (No. 1) involved in reflex contraction of the cremaster muscle (vide supra), except that it comes not from a surface in contact with the external environment but from one related to the internal environment (if such a term is permitted), i.e., it comes from peritoneum instead of skin. In either case, the sensory neuron (No. 1) is simple and single, has its cell body in the dorsal root ganglion and makes its synapse, not in any ganglia at all, but in the spinal cord.

Again, like the somatic arc, the sensory neuron (No. 1) forms its synapse with an intercalated neuron (No. 2), whose cell body and all its processes lie within the central nervous system. This intercalated neuron (or system, as the case may be) transmits the stimulus to the anterolateral part of the spinal cord, where small cell bodies of the motor neurons (No. 3) are located. Making synapse with one of these motor cells, the intercalated neuron discharges the stimulus, and the axon of the motor neuron (No. 3) transmits the stimulus out of the spinal cord via the ventral root, traverses the white ramus communicans and enters the corresponding chain ganglion of the autonomic system. Here may occur the one most striking and distinctive feature of the autonomic arc: a synapse may be made in the chain ganglion between the axon of neuron No. 3 and the dendrites of neuron No. 4, the cell body of No. 4 lying in the chain ganglion. The axon of No. 4 then passes over one or another distributing path to visceral muscle or gland, in the case at hand let us say to the intestine. The second motor neuron (No. 4) obviously has no counterpart at all in the somatic arc.

Specific names are required for these two neurons on the effector (motor) side of the autonomic arc. Neuron No. 3, whose cell body is always in the central nervous system and whose axon always reaches some ganglion of the autonomic system before it forms a synapse, is from this latter circumstance designated preganglionic. Hereafter, for sake of emphasis, we shall refer to this neuron as Preg. No. 3. The other motor neuron (No. 4) in the autonomic arc always has its cell body in one of the chain ganglia or in an autonomic collateral ganglion like the coeliac, and its axon always terminates in smooth or cardiac muscle or gandular epithelium. This neuron, since it always leads away from a ganglion, is called postganglionic, and will be referred to hereafter as Postg. No. 4.

Now the site of synapse between Preg. No. 3 and Postg. No. 4, as described above, in the first ganglion reached by the preganglionic axon is the simplest, but not the most frequent, possibility. It is merely one of four possibilities for such synapse, and will be referred to as Possibility I. In Possibility II the axon of Preg. No. 3 does not form a synapse in the first chain ganglion it reaches, but passes directly through this ganglion and traverses the autonomic chain upward or downward through a variable number of ganglia to reach the particular ganglion where it forms its synapse with Postg. No. 4. For example, the axon

of Preg. No. 3 may come out of the spinal cord by way of any one of the upper five thoracic nerves, enter a corresponding chain ganglion, but pass entirely through intervening ganglia to reach the superior cervical ganglion, where it forms a synapse with Postg. No. 4. This latter neuron then sends its axon down the neck via the superior cardiac nerve to supply the heart. The path just traced is in fact the one taken by the thoraco-lumbar autonomic (sympathetic) nerve supply of the heart. In a similar way the middle and inferior cervical ganglia send postganglionic fibers to the heart, their preganglionic fibers being derived from cell bodies lying in the antero-lateral part of the spinal cord in the region of the upper five thoracic nerves. Below the level of the fifth thoracic nerve Possibility II may operate down the gangliated chain instead of up, i.e., a Preg. No. 3 axon may pass through the first ganglion it enters and through numerous other ganglia at lower levels before it finally forms a synapse with Postg. No. 4.

In Possibility III the axon of Preg. No. 3 enters a chain ganglion but passes without synapse not only through but out of this ganglion, e.g., via one of the splanchnic nerves to a collateral autonomic ganglion, let us say the coeliac, and there forms a synapse with Postg. No. 4, which latter sends its axon away from the coeliac ganglion to the intestine, or other visceral termination. Possibility III is the one utilized by most of the thoraco-lumbar autonomic supply to the abdominal viscera.

A remarkable variant of Possibility III is the nerve supply of the suprarenal gland. Gross dissection shows a very rich spray of nerves passing direct from the coeliac ganglion to the suprarenal gland. Such a nerve supply is obviously much greater than the gland would seem to require for its own adjustments. However, Elliott (1913) found that these nerves are not the usual postganglionic fibers with cell bodies in the coeliac ganglion, as one finds elsewhere in Possibility III; rather they are in the main preganglionic. This means that their cell bodies are in the spinal cord below the level of the fifth thoracic nerve; as axons of Preg. No. 3 they pass to and through the chain ganglia, via the greater splanchnic nerve to and through the coeliac ganglion to the chromaffin tissue of the suprarenal gland, where they end without the usual synapse involving postganglionic neurons. Stimulation of these preganglionic fibers to the suprarenal chromaffin is regarded as forming a charactertisc product of this part of the suprarenal, namely sympathin, which is circulated by the blood and is said to reproduce and thus replace the activities of the postganglionic neurons.

Possibility IV is unique as an autonomic distributing mechanism, in that it is not directed to the thoracic and abdominal viscera and their blood vessels at all, but is concerned entirely with supplying the sweat glands (sudomotor), the hair follicles (pilomotor), the subcutaneous and other vascular smooth muscle of peripheral parts of the body. Let us suppose that a preganglionic neuron (Preg. No. 3) forms a synapse in the first ganglion it reaches, as in Possibility I. But let us further suppose that the postganglionic neuron (Postg. No. 4), with which this synapse is made, sends its axon back to the same spinal nerve with which

its ganglion corresponds. This axon, incorporated in the spinal nerve, might supply any one of the subcutaneous or other peripheral structures mentioned above, e.g., a sweat gland. Thus a mechanism is provided for very extensive autonomic supply of peripheral structures. These postganglionic fibers, which recur onto the spinal nerves from autonomic ganglia, are in very great part non-medullated, hence in fresh material are gray in appearance.

Possibility IV, then, exemplifies the gray rami communicantes, which have been mentioned above as present for each spinal nerve of the entire series. A gray ramus communicans may be said to fulfill the following requirements: 1. It is always effector (motor); 2. It is always postganglionic; (3) It is always recurrent to the spinal nerve for peripheral distribution; (4) It is, with few exceptions, non-medullated, therefore gray. It is wholly incorrect to speak of all postganglionic fibers as gray rami. All gray rami are postganglionic fibers, but all postganglionic fibers are not gray rami. Only those recurring to a spinal nerve and accompanying this nerve to the peripheral distributions constitute a gray ramus.

Having thus explicitly defined a gray ramus, it is well for sake of contrast to define a white ramus, even though the material for such a definition has already been given in some detail. A white ramus is a direct connection between the thoraco-lumbar autonomic system and the spinal cord, and contains both (1) visceral sensory fibers directed via the dorsal root into the spinal cord, and (2) preganglionic motor fibers directed from the cord via the ventral root to the autonomic ganglion. The sensory and motor fibers are enclosed in the same sheath, most of the fibers are medullated, hence white, and by this means connection is made between spinal cord and autonomic ganglia of the thoracic and upper lumbar nerves. White rami do not appear elsewhere in the spinal series. Gray rami appear throughout the spinal series, one ramus to each spinal nerve, and connect not the spinal cord with the autonomic ganglia but the autonomic ganglia with the peripheral nerves. Gray rami therefore are the peripheral distribution of the autonomic system; white rami are the central connections of the system.

As shown by a comparison of the somatic and autonomic arcs, the one outstanding difference is on the effector (motor) side. Where the motor element of the somatic arc, e.g., the cremaster reflex, is always represented by a single neuron, the corresponding part of the autonomic arc is always, except in the supply of chromaffin tissue, represented by two neurons, preganglionic and postganglionic. The questions now arise: (1) are the numbers of preganglionic and postganglionic neurons equal, i.e., does a simple one-to-one relation exist between them? or (2) do numerous preganglionic neurons discharge into a single postganglionic neuron, resulting in a type of avalanche conduction, as in the olfactory bulbs or cerebellum? or (3) does one preganglionic neuron form synapses with numerous postganglionic neurons, producing a diffuse reaction? The third alternative is clearly the one prevailing in the autonomic arc. According to Kuntz (1934), there are, on the average, 32 postganglionic neurons to each

preganglionic neuron. This means that a preganglionic neuron entering a chain ganglion may form a synapse in this ganglion (Possibility 1), may send processes up and down the gangliated chain and form synapses at various levels in both directions (Possibility II), may also send a process through the chain ganglion to a collateral ganglion and there form numerous synapses (Possibility III), and finally it may by offsets at various levels of the gangliated chain form synapses with the neurons of gray rami (Possibility IV). Not only may a single axon of the preganglionic neuron make any or all of the above connections, but also it may send one of its processes through chain and collateral ganglia to the chromaffin tissue of the suprarenal gland and there produce sympathin, with systemic postganglionic effects by way of the blood stream.

As a corollary of this last response, a further possibility is suggested. Since the chain ganglia are usually accompanied by aggregates of chromaffin tissue, it is highly probable that a single preganglionic axon may form not only the various synapses available in Possibilities I to IV, but also may by offsets enter chromaffin aggregates at levels up and down the gangliated chain and thus on stimulation produce sympathin as in the suprarenal gland. This generalized postganglionic effect would obviously carry far beyond any known distribution of the thoraco-lumbar autonomic system the results of stimulation of this system.[1]

To review the thoraco-lumbar autonomic arc by means of example is, after a fashion, to observe it in operation. Let us take a case of renal colic and trace the pathways by which intestinal stasis, rapid heart and cold sweat are produced. The sensory neurons (No. 1) from the ureter pass through the aorticorenal ganglion without synapse, traverse the lesser splanchnic nerve, enter and leave the chain ganglia without synapse, are carried by white rami to the spinal nerves, thence to the dorsal root ganglia where the sensory cell bodies lie but where no synapse is formed, then by central processes into the posterior part of the spinal cord. Here the sensory neurons (No. 1) form synapses with intercalated neurons (No. 2), or intercalated systems. Disregarding now the hierarchy of complexity which may arise within the intercalated systems at various levels of the cerebrospinal axis, it suffices for present purposes to say that an intercalation is made from posterior to antero-lateral part of cord, where synapse is made with motor neurons (Preg. No. 3). These send axons out via white rami to chain ganglia, in which and beyond which Possibilities I to IV are available. Utilizing Possibility I, some of the axons may form synapse with Postg. No. 4 in the first chain ganglion, or utilizing Possibility II in some other chain ganglion, the axons of Postg. No. 4 then passing to the smooth muscle of the intestine, where inhibition of peristalsis results. Much more frequent than either of these paths, however, is that of Possibility III, where preganglionic axons pass through the chain ganglia and via splanchnic nerves reach the coeliac ganglion, where numerous synapses with Postg. No. 4 are made and

1. Since making this suggestion our attention has been called to the work of W. H. Hollinshead, who finds that nerve fibers going to the abdominal chromaffin tissue are preganglionic, from which he concludes that this is the typical innervation of chromaffin tissue in general. (J. Comp. Neurol., 67: 133-141, 1937).

from which postganglionic fibers reach the intestine. Thus we have accounted for the path whereby renal colic results in intestinal stasis (a characteristic result of thoraco-lumbar autonomic stimulation).

In the production of rapid heart—supposing that the sensory neuron (No. 1) and intercalated (No. 2) remain the same—then Preg. No. 3 enters the chain ganglion, which corresponds to its spinal nerve and white ramus, but utilizes only one path, viz., Possibility II, whereby preganglionic axons pass up the gangliated chain, in this instance to form synapses in the inferior, middle and superior cervical ganglia, mainly the last, whence Postg. No. 4 axons descend to the heart and produce acceleration (another characteristic thoraco-lumbar autonomic reaction).

In the elaboration of cold sweat—again sensory neuron (No. 1) and intercalated (No. 2) remaining the same—Preg. No. 3 enter the first chain ganglia they meet and there utilize Possibility IV, whereby synapse is made with Postg. No. 4. The axons of these postganglionic neurons recur to the spinal nerve as gray rami, pass with the spinal nerves to extensive peripheral distributions, supplying among other structures the sweat glands, which are caused to secrete, and the smooth muscle of subcutaneous blood vessels, which are contracted, giving rise to a cold pale skin surface.

So much for the simple anatomic basis of these reactions. However, it should be stated that these definite neural paths do not give the whole account of such reactions. Here, as elsewhere, the chromaffin system must be reckoned with as a means of simulating postganglionic activities. Also, it is wrong to suppose that all effector action is the result of specific sensory stimulus of the kind noted above. For the sake of clear illustration, care has been taken to give a complete sensory-motor arc in each case. But in the actual operation of the autonomic system the sensory side of the arc is frequently replaced by other causative factors.

Thus in a case of surgical shock, where intestinal stasis, rapid heart and cold sweat are among the clinical manifestations, the effector paths may be those cited above for renal colic, but the exciting cause is thought by some investigators to be histamine, derived from cleavage products of protein molecules. Thus the sensory side of the arc is replaced by a chemical circulated in the blood and produced in a traumatic area by the breaking down of tissue proteins. Burns, amputations and many other surgical conditions, even apparently so slight as manipulation of the peritoneum, may produce the clinical picture of surgical shock. In profound conditions of shock, even though the skin is pale and cold, the deep vessels, especially those of the viscera, including the capillary beds, are widely dilated, a circumstance giving rise to the statement that in surgical shock a patient may bleed to death within his own blood vessels.

Finally account must be taken of the fact that the sensory neuron (No. 1) may be entirely replaced by excitation of central origin. Thus emotional states, such as fear, anger, grief, may stimulate the effector side of the autonomic system with results wholly comparable to those arising from specific sensory stimulation.

THE CRANIO-SACRAL AUTONOMIC (PARASYMPATHETIC) SYSTEM

It has been noted that the limbs interrupt the autonomic outflow from the central nervous system. To avoid complicating the narrative at that time nothing was said of the autonomic outflow above the upper extremity, i.e., in the head region, or of that below the lower extremity, i.e., in the sacral region. Since these two outflows resemble each other in salient morphological features, are functionally similar, and are in certain striking ways functionally antagonistic to the thoraco-lumbar outflow, they are usually considered together as the cranio-sacral autonomic system.

The morphologic features which characterize the cranio-sacral system are as follows: (1) they have no white rami or other connections with the chain ganglia; (2) they have nothing comparable to the collateral ganglia; (3) they have no gray rami; (4) their synapses between preganglionic and postganglionic neurons and therefore the cell bodies of the latter are located in so-called terminal ganglia, which lie close to, or within, the parts or viscera supplied.

At this time it is well to discuss in a methodical way the four ganglia of the cranial autonomic system, especially since most of the current textbooks describe these ganglia with the 5th cranial (trigeminal) nerve and in so doing become lost in inconsequential morphology, with no mention of the functional significance of the cranial autonomic system, as a whole.

The four ganglia to be described here are (1) the ciliary, (2) the sphenopalatine, (3) the submaxillary and (4) the otic. Textbooks usually assign to each of these ganglia three roots—motor, sensory and sympathetic. The implied antithesis in these terms is misleading. The so-called motor root should be designated cranial autonomic, the sympathetic root will hereafter be termed thoraco-lumbar autonomic. All these ganglia, except the otic, convey sensory fibers from outlying areas to the 5th cranial (trigeminal) nerve, but since these fibers have their cell bodies in the semilunar ganglion (sensory) of the 5th nerve and pass through the autonomic ganglia with no synapse whatsoever, the ganglia of the autonomic system are not functionally a part of the trigeminal system at all. The thoraco-lumbar autonomic fibers likewise pass directly through the ganglia without synapse. The preganglionic cell bodies of the thoraco-lumbar system for distribution to the head are located in the spinal cord from thoracic segments 1 to 5, pass over by white rami to the gangliated chain of the thoracic system at these levels and ascend to the superior cervical ganglion, where they form synapses with postganglionic neurons whose cell bodies lie in the superior cervical ganglion and whose fibers are distributed through the autonomic ganglia of the head to the iris, mucosa and blood vessels, lacrymal and salivary glands. Accordingly, the cranial autonomic ganglia are not functionally a part of the thoraco-lumbar autonomic system.

The cranial nerves supplying these four cranial autonomic ganglia with preganglionic fibers are: the 3rd cranial (oculo-motor) nerve to the ciliary ganglion; 7th cranial (facial) nerve to the sphenopalatine ganglion via the greater superficial petrosal nerve and to the submaxillary ganglion via the

chorda tympani nerve; the 9th cranial (glossopharyngeal) nerve to the otic ganglion via the lesser superficial petrosal nerve. The 10th cranial (vagus) nerve and the 11th cranial (accessory—to the vagus) complete the cranial autonomic outflow, these last two being distributed as preganglionic fibers to viscera of the thorax and abdomen.

Each of these autonomic ganglia lodges the cell bodies of the postganglionic neurons and the synapses between the preganglionic and postganglionic neurons. The postganglionic fibers of the ciliary ganglion are distributed to the ciliary muscles, and to the circular (constrictor) muscle of the iris, the radiating (dilator) muscle of the iris being supplied by the thoraco-lumbar autonomic fibers from the superior cervical ganglion via the ciliary ganglion. The postganglionic fibers of the sphenopalatine ganglion are distributed to the blood vessels and glands of the nasal mucosa and to the lacrimal gland. The postganglionic fibers of the submaxillary ganglion are supplied to the blood vessels and gland cells of the submaxillary and sublingual glands. The postganglionic fibers of the otic ganglion are supplied to the blood vessels and gland cells of the parotid gland.

In view of certain very confusing statements made by most textbooks regarding the otic ganglion, it is necessary to correct these statements with much emphasis. The nerve to the internal pterygoid muscle is frequently given as the motor root of the otic ganglion. This is distinctly not in accord with our present knowledge of this ganglion or of this nerve. The nerve is not recognized as an autonomic carrier at all; it is simply the motor nerve to the internal pterygoid muscle, and as such has no functional significance for the otic ganglion. It frequently does pass through the ganglion on its way to the muscle, but there is no evidence that it forms any synaptic connections within the ganglion. As already stated, the textbook motor root (in our terminology the cranial autonomic root) is the lesser superficial petrosal nerve from the 9th cranial. This same nerve also transmits the sensory fibers, which pass through the otic ganglion. Accordingly in spite of all apparent connections with the 5th cranial nerve, the otic ganglion is in no way related to this nerve, not even on the sensory side. The communications of the otic ganglion with the chorda tympani nerve and with the nerve to the tensor tympani are doubtless like the connection with the nerve of the internal pterygoid muscle, i.e., of no functional (autonomic) significance. The communications of great importance are those with the two roots of the auriculo-temporal nerve, since by these means the postganglionic fibers are distributed from the otic ganglion to the parotid gland. It is thus apparent why the auriculo-temporal nerve, as it enters the parotid gland is quite sizable, but as it emerges from the gland it has been reduced to a small cutaneous branch, a great many of its fibers having been drawn off by the parotid gland.

In general, it may be said of these cranial autonomic ganglia that their branches convey two types of effector fibers, and the impulses transmitted by these fibers are to a large extent antagonistic. The most conspicuous example of this antagonism is the supply of the ciliary ganglion to the iris; the cranial

autonomic fibers supply the circular muscle of the iris and cause constriction of the pupil; the thoraco-lumbar autonomic fibers supply the radiating muscle of the iris and cause dilation of the pupil. The other cranial ganglia supply vasodilator fibers (cranial autonomic) and vasoconstrictor fibers (thoraco-lumbar autonomic) to mucosa and glands. Also to gland cells they supply trophic fibers (thoraco-lumbar autonomic) whose impulses change the cell metabolism in such a way as to cause the laying down in the cell of secretory granules, and secretory (cranial autonomic) fibers whose impulses cause the extrusion of these granules as active secretion. In their action on gland cells the two autonomic systems are seen to be complementary rather than antagonistic. The cranial (vagus) and sacral autonomic fibers on the one hand and the thoraco-lumbar autonomic fibers on the other will be found to act as antagonists on the viscera of the thorax, abdomen and pelvis. Thus vagus impulses slow the heart, while thoraco-lumbar (sympathetic) impulses accelerate the heart. Curiously enough, on the other mobile viscera the cranio-sacral system accelerates the action of smooth muscle, while the thoraco-lumbar system inhibits such action.

Since the 10th cranial nerve or vagus (with fibers from its accessory or 11th cranial) provides the sole pathway for distribution of cranial autonomic fibers to the viscera of thorax and abdomen, it is well to examine the mechanism of this pathway in some detail. The vagus is a mixed nerve, many of its fibers being visceral sensory with cell bodies in the jugular and nodosal ganglia (functionally dorsal root ganglia). The motor fibers in the vagus are of two kinds: (1) branchiomeric, to striated muscles, e.g., of the larynx and pharynx and having their cell bodies in the nucleus ambiguus of the medulla; (2) cranial autonomic to viscera of thorax and abdomen. These latter are the fibers to be considerd here.

The autonomic fibers of the vagus are preganglionic and like all preganglionic neurons the cell bodies are in the central nervous system, in this case in the dorsal motor vagus nucleus of the medulla. Pursuing a long course into the thorax and abdomen, these preganglionic axons form synapses about postganglionic cell bodies in, or very near, the viscera supplied. In the case of the heart these postganglionic neurons are located in the superficial and deep cardiac plexuses and within the heart musculature. In the case of the gastro-intestinal tract the vagus terminates about the intrinsic plexuses of the visceral wall, i.e., the plexuses of Meissner and Auerbach, which contain large ganglion cell-bodies of the postganglionic neurons.[2]

Let us take a specific example of the antagonistic reflex action of the vagus (cranial autonomic) and splanchnic (thoraco-lumbar autonomic); such an example is found in the filling and emptying mechanisms of the stomach. It is said (Wilkinson) that the thoraco-lumbar system inhibits the contractions of the stomach wall but is motor to the pylorus. Thus with the pylorus in a state of tonic contraction and the walls of the stomach relaxed, the stomach readily

2. Langley and those who follow his views regard these myenteric plexuses as a highly autonomous enteric system and do not concede that the postganglionic status of these neurons in the vagus path has been satisfactorily proved.

fills—up to a certain limit of distention. When the limit is reached, sensory fibers from the stomach wall are stimulated. These fibers pass in the vagus, with cell bodies in the root ganglia of this nerve, and by intercalation within the medulla stimulate the dorsal motor nucleus. The preganglionic cell bodies located there send axions via the vagus to the stomach, where they form synapses with postganglionic neurons in the stomach wall. These neurons on stimulation cause contraction of the stomach musculature and relaxation of the pylorus. Thus the cranial autonomic system operates the emptying mechanism of the stomach, the thoraco-lumbar system operates the filling mechanism. Consequently just what shape the stomach presents at any given time depends on the interaction of these two systems.

The sacral autonomic system, like the cranial, forms no connections with the chain ganglia, therefore has neither white nor gray rami communicantes, has nothing comparable to collateral ganglia, but has relatively long preganglionic axons which form synapses with postganglionic cell bodies on, in or near the viscera supplied.

The sacral outflow is limited to sacral nerves II and III or III and IV, or sometimes II, III and IV. Thus sacral autonomic cell bodies lying in the anterolateral part of the sacral region of the cord (about the level of the first lumbar vertebra) send axons out the ventral root and down thereby through the cauda equina to, say, the second sacral nerve exit. After the mixed (sensory-motor) nerve is formed, these preganglionic sacral autonomic axons leave the nerve to form a sacral autonomic root, a so-called nervus erigens (plural, nervi erigentes), which makes no connection with the gangliated chain of the thoraco-lumbar autonomic system, but passes directly to the bladder, prostate, colon, rectum, uterus, etc. In the dense pelvic plexuses associated with these organs, or within the organs themselves, these long preganglionic axons form synapses with the short postganglionic neurons for final distribution.

Examples will show how the sacral and thoraco-lumbar autonomic systems function in very precise and efficient antagonism; the filling and emptying mechanisms of the urinary bladder and rectum are taken as illustrations (see Wilkinson). The formula for nerve supply of the bladder is as follows: the thoraco-lumbar autonomic is inhibitory to the musculature of the bladder wall and motor to the bladder sphincter; the sacral autonomic is motor to musculature of wall and inhibitory to sphincter. As the bladder becomes gradually filled by propulsion of urine from the ureters, the pressure within the bladder just as gradually increases—up to a certain limit. When this limit is reached, there is normally a sensation giving information of the condition, which is followed by a judgmental response to empty or retain the bladder contents, as the case may be. By voluntary contraction of the diaphragm and abdominal walls the pressure within the bladder may be sufficient to overcome the tonic contraction of the bladder sphincter and thus transfer control of the bladder from the thoraco-lumbar to the sacral autonomic system. This latter system contracts the musculature of the bladder wall and at the same time relaxes the sphincter. Thus,

once started by voluntary action, the emptying mechanism is continued by the sacral autonomic reflex.

It sometimes occurs that psychic factors greatly reinforce the sphincteric contraction, so that even with much effort the emptying mechanism cannot be initiated. Once initiated, however, it is completed by the sacral autonomic reflex without further voluntary effort. Even so, in normal individuals the emptying mechanism may be interpreted at will. On the other hand, during sleep and similar states of unconsciousness the filling and emptying mechanisms of the bladder may depend solely on the autonomic reflexes.

The mechanisms of the rectum are so similar to those of the bladder as to require no detailed account. Here, again, the formula is: the thoraco-lumbar system for inhibition of the rectal wall and for tonic contraction of the rectal sphincter; the sacral system for inhibtion of the sphincter and for active operation of the wall. Also again these mechanisms are normally initiated and interrupted at will. The sphincteric relaxations of bladder and rectum clearly exemplify a circumstance often overlooked, viz., that cessation of contraction of a muscle is just as much a judgmental response as the contraction itself.

The specificity of actions of the two autonomic systems, thoraco-lumbar and cranio-sacral, is apparent wherever their actions have been thoroughly studied. We have already seen that a specific hormone, sympathin, elaborated by chromaffin tissue, reproduces and replaces the action of postganglionic neurons in the thoraco-lumbar system. An equally specific chemical or humoral substance is indicated for the cranial system, as shown by the following experiment: If a frog's heart be perfused during vagus stimulation and the perfusate be introduced into the circulation of another frog, all the characteristics of vagus stimulation will appear in this other frog. Thus stimulation of the vagus liberates a substance at the terminals of the nerve, which substance can be transported to another animal and there reproduce the picture of vagus stimulation. Biochemical assay shows that this substance is closely similar to acetyl cholin.

Viewing the body as a whole in the light of its autonomic supplies, we see that the thoraco-lumbar system not only supplies its immediate regions but also spreads fanwise from its source of white rami to reach the head and tail parts of the body; also it has definite distributions (gray rami) to peripheral regions, including the extremities. The cephalic autonomic outflow (from mesencephalon and rhombencephalon) not only supplies its own region but also spreads downward by way of the vagus to overlap and thus afford antagonistic supply to much of the thoraco-lumbar visceral area. The caudal autonomic outflow (similar in function to the cranial, but from sacral nerves) not only supplies pelvic regions but also spreads upward to overlap and thus afford antagonistic supply to those parts of the lumbar visceral area not reached by the vagus. Thus we find a fully elaborated dual nerve supply for visceral areas of the head, thorax, abdomen and pelvis. We might from analogy assume that smooth muscles and glandular epithelium of the peripheral regions, including the extremities, would also receive a similar dual nerve supply. As mentioned above, the thoraco-

lumbar system by its gray rami does have a known distribution to these parts. But a concurrent cranio-sacral distribution in the form of nerve fibers to the periphery has not been demonstrated.

It is seen from the foregoing discussion that three types of cell aggregates are constantly referred to as taking part in the autonomic receptor-effector arc. These are (1) the dorsal root (sensory) ganglia, (2) the chain, collateral and terminal ganglia (all synapse stations on the motor side of the arc) and (3) the chromaffin bodies, of which the suprarenal medulla is the largest. The question arises: is there any necessary relation between these three types of cell aggregates?

A brief consideration of their developmental history not only will provide an answer to this question, but also will serve to demonstrate the essential unity of the autonomic system as a whole. It will be recalled that after the neural plate and groove have formed, a linear mass of ectodermal cells takes up a position where the ectoderm and neural plate are for a time continuous. This linear mass of cells is called the neural (ganglion) crest, in the sense that it forms a crest or ridge along the dorso-lateral part of the neural tube, when this latter becomes fully separated from the ectoderm. Eventually this crest of cells takes a more ventrolateral position to lie between the neural tube and the series of myotomes, being parallel to the cerebro-spinal axis on either side as far forward as the otic vesicle. From the crest, as thus located, three cell masses are differentiated: (1) the sensory ganglia, whose cells are at first bipolar and whose fibers go to form the dorsal roots; (2) the autonomic ganglion cells, which migrate ventrally on either side toward the dorsal aorta, and at an early period show a segmental arrangement in the trunk region (Kuntz, '10); (3) the chromaffin cells, which follow closely the autonomic ganglion cells both in course of migration and in arrangement.

Thus in terms of cell lineage there is seen to be a unity of relation between all three cell aggregates involved in the autonomic receptor-effector system. In the light of this unity, it is apparent that any attempt to consider only the effector (motor) side of the system, as represented by Langley's use of the term autonomic, is purely arbitrary and can at best be regarded as simply an experimental device.

BIBLIOGRAPHY

BICHAT, M. F. X.: Recherches physiol. sur la vie et la mort. Paris, 1800.

CANNON, W. B.: Bodily Changes in Pain, Hunger, Fear and Rage. New York and London, 1915. The Wisdom of the Body. New York, 1932.

CARLSON, A. J.: The Control of Hunger in Health and Disease. Chicago, 1916.

ELLIOTT, T. R.: The Innervation of the Adrenal Glands. *J. Physiol.*, 46:285-290, 1913.

GASKELL, W. H.: On the Structure, Distribution and Function of the Nerves which Innervate the Visceral and Vascular Systems. *J. Physiol.*, 7:1-81, 1886.
The Involuntary Nervous System. London. 1916.

HOLMES, W. H. and RANSON, S. W.: Cervical Sympathectomy in Angina Pectoris. *J. Lab. & Clin. Med.*, 10:183-189, 1924.

JOHNSON, S. E.: On the Question of Commissural Neurons in the Sympathetic Ganglia. *J. Comp. Neurol.*, 29:385-404, 1918.
and MASON, M. L.: The First Thoracic White Ramus Communicans in Man. *J. Comp. Neurol.*, 33:77-84, 1921.

JOHNSTONE: Philosoph. Trans., London, 54:177. 1764.

KRAMER, J. G. and TODD, T. W.: The Distribution of Nerves to the Arteries of the Arm, with a Discussion of the Clinical Value of Results. *Anat. Rec.*, 8:243-255, 1914.

KUNTZ, A.: The Development of the Sympathetic Nervous System in Mammals. *J. Comp. Neurol.*, 20:211-258, 1910.

The Autonomic Nervous System. Philadelphia. 1934.

LANGLEY, J. N. and DICKINSON, W. L.: Pituitrin and Nicotin. *J. Physiol.*, 11:265-306. 1890.

LANGLEY, J. N.: On the Union of Cranial Autonomic (Visceral) Fibers with the Nerve Cells of the Superior Cervical Ganglion. *J.Physiol.*, 23:240-270. 1898.

The Sympathetic and Other Related Systems of Nerves. Schaefer's Textbook of Physiology, London, 616-696, 1900.

On Axon-reflexes in the Preganglionic Fibers. *J. Physiol.*, 25:364, 1900.

The Autonomic Nervous System. *Brain*, 26:1-26, 1903.

The Autonomic Nervous System. Cambridge, 1921.

MacCREA, E. D'A.: The Abdominal Distribution of the Vagus. *J. Anat.*, 59:18-40, 1924-25.

MUELLER, L. R.: Die Lebensnerven, ihr Aufbau, ihre Leistungen, ihre Erkrankungen. Berlin. 1924.

RANSON, S. W. and BILLINGSLEY, P. R.: The Superior Cervical Ganglion and the Cervical Portion of the Sympathetic Trunk. *J. Comp. Neurol.*, 29:313-358, 1918.

ROSSI, O.: On the Afferent Paths of the Sympathetic Nervous System, with Special Reference to Nerve Cells of Spinal Ganglia Sending Their Peripheral Processes into the Rami Communicantes. *J. Comp. Neurol.*, 34:493-505, 1922.

WILKINSON, H. J.: The Autonomic Nervous System. *M. J. Australia*, 1:801-812, 1935.

WINSLOW, J. B.: Exposition anatomique de la structure du corps humain, Paris, 1732.

WOOLLARD, H. H.: The Innervation of the Heart. *J. Anat.*, 60:345-373, 1926.

et al,: Discussion on the Functions of the Sympathetic Nervous System. Proc. Roy. Soc. Med., 1579-1603, August, 1932.

and PHILLIPS, R.: The Distribution of Sympathetic Fibers to the Extremities. *J. Anat.*, 67: 18-27, 1932.

and NORRISH, R. E.: The Anatomy of the Peripheral Sympathetic Nervous System. *Brit. J. Surg.*, 21:83-103. 1933.

The Peripheral Sympathetic Nervous System. *Brit. J. Surg.*, 23:425-432, 1935.

A Study of the Predictive Value of the Medical Aptitude Test at Vanderbilt School of Medicine

BEVERLY DOUGLAS
Assistant Dean, Vanderbilt University School of Medicine
Nashville, Tennessee

The purpose of this study is, primarily, to determine the degree of correlation which has been attained between aptitude test scores made by men as premedical students and their success in the four years of medical school work. Secondarily, our purpose is to compare the relative merits of the aptitude test and the general and scientific premedical grades in predicting the degree of a student's success in medical school.

SCOPE OF PRESENT STUDY

The records of the students in the five successive classes from 1933 through 1937 were used. The study, therefore, covers a period of nine years, from 1929 to the present. In all, the records of 191 students who have taken the aptitude test are included. The remaining students, numbering approximately 55, were accepted without having taken the test. At the outset it must be admitted that there would seem to be little value in the results of the study of such a small series of students as is available at the present; nevertheless, the results are presented for whatever value may be derived from them in a limited way.

Dr. Moss[1] presented results in 1936 of a "Comparison of Achievement in the First Year of Medicine of Students Having Taken the Test With Those Admitted Without Test Scores." He included 341 students who had taken the test in ten schools and 181 who had not. His results are very illuminating and, therefore, are included here. He states, "The percentage of failures among those who had taken the test was 12.0 as compared with 19.0 in the untested group. Moreover, only 8 per cent of the tested group but 14 per cent of those without test scores withdrew before the close of the year. In the tested group, 20 per cent failed or withdrew during the year, while in the untested group 33 per cent were eliminated in this way. These figures show that there is a decided tendency for the poorer applicants to avoid taking the test." "Untested students," he concludes, "are more likely to fail or withdraw and less likely to succeed than are students who have taken the test. After studying the students who have been allowed to enter without the test at Vanderbilt, I am certain that the majority have not done as good work as have the tested students. I have, however, not included the untested students in this study."

In certain classes, there were no men representing some of the deciles of the

1. Moss, F. A.: J. A. Am. M. Coll., 12: 34 (Jan.), 1938.

aptitude test score, especially the lower ones. Other deciles were represented—as in the class of 1933—by only one or two men. Under such circumstances, on account of exceptions caused by the human element, one would not expect to find very uniform correlations. Yet, it is striking in the case of the aptitude test what "clean-cut" correlations seem to exist in our series.

In this study, the grades in each of the four years of medicine for the different classes are compared to the test scores. However, for purposes of ready reference, graphic charts are presented which relate the aptitude test scores and the freshmen grades in the one instance, and the same scores and the average grades for the entire four years in the other instance. Included also is a comparison of premedical grades, both general and scientific, with freshmen medical grades, and also the four year average medical school grades properly related, to the premedical averages.

In general, the methods of Moss have been followed in the comparison of these grades. Having seen service on the aptitude test committee for several years, I am conversant with his method of presenting comparative results, and I think that it is very clear. Since "form one" of the aptitude test was first presented by Dr. Moss in 1928 and given to 1,552 medical students, the material of the test has gradually changed in character of content.

In December, 1935, the test was given to 10,671 premedical students in 624 schools. This number comprised 82 per cent of all men entering medical schools. The test of that year is comprised of five parts. These are described by Dr. Moss[2] as follows:

> "(1). General Information; (2) Vocabulary; (3) Spelling; (4) Logical Reasoning; and (5) Understanding of Printed Material. This form of the test is somewhat different from the forms used in the past, the main difference being that the preliminary study sheet and the anatomical drawing were dispensed with and the test of general information was added.
>
> The mental processes which it was hoped to tap by each of the tests are, briefly, as follows:
>
> Test 1 consists of selected items from the fields of history, literature, government, economics, geography, general science, sports and transportation. In addition, a certain number of items designed to measure social intelligence or ability to get along with others were included. This test meets the widespread demand from many of the admission officers that some part of the medical aptitude test should indicate how well and how intelligently the student has profited by his general studies and contacts as contrasted with the more technical training which he would get in his required premedical training in biology, chemistry and physics.
>
> Test 2 is a specialized intelligence test based on the student's knowledge of premedical work and his general reading and information. It is only logical that the more familiar the student is with medical and scientific terms, the

2. *Ibid.* 1, p. 29.

better he will succeed in the medical course. Moreover, if he has had a continuing interest in medicine, one would have expected him to have done some general reading along that line, and to have picked up, aside from his premedical course, a certain amount of information, as indicated in the vocabulary. This test of ninety items gives a fairly good indication of the student's background, interest and specialized ability in this field.

Test 3 is a spelling test consisting of forty items. In a number of our discrepant cases of students who do fairly well on the test, but still fail or get very low grades in the medical school, it has been stated that the students fell down on the written work because they could not speak and could not write proper English. It was decided, therefore, to introduce a short section designed to measure their ability to recognize words that were spelled incorrectly when they saw them. This also measures visual memory.

Test 4 is designed to measure the student's ability to draw logical conclusions from a given set of data. Much of the future work in medicine will depend on such ability.

Test 5 is designed to measure a student's ability to understand very difficult printed material when he has it continually before him. In accordance with the suggestions of Dr. Chesney's Committee, the amount of material given in this section of the test was doubled. In this instance, a passage was selected similar to one the student might find in a course in pharmacology and also one which he would find in obstetrics. The student has enough time to read the passages over and then refer to them as often as he wishes in answering the thirty questions. If he is unable to understand such passages as above, the chances are against his understanding similar passages in connection with his medical course. There is one element, however, which must be considered in connection with this test. Inasmuch as it is the last test, the student who is by nature very slow may have consumed so much time on the other tests that he will not do himself justice on this particular test. In general, however, the student who is slow will also be handicapped when he gets into medical school, because in the medical curriculum, as probably in no other professional course, will the student be so loaded down with material that if he is extremely slow he will find it impossible to master the work.

While the series of five tests which make up the medical aptitude test, as a whole, are not designed as speed tests, it is inevitable that the rate of working should be a factor in determining the final score. Also, in the medical course, while the assignments are not designed to force the average student to work faster than his normal speed, it is inevitable that the slow student would have to work faster than his normal speed in order to keep up with his medical assignments. In other words, if one student can learn a given assignment in medicine in an hour, whereas it takes another student two hours to learn the same assignment, it is quite obvious that the fast learner will have twice as much time to put on his other assignments as will the slow student."

At Vanderbilt each year there are from 700 to 800 applicants for the 50 available places. Therefore, the committee considers as very important every bit of evidence of a man's relative likelihood to succeed.

In order to determine what correlation, if any, exists between the aptitude test scores and success in the medical school, we shall first analyze the various charts by years.

The ratings will be clarified if the reader keeps in mind the fact that the tenths or deciles of the test scores mean tenths of all the ten thousand or more men taking the test ranked according to the scores they made. In this way, the test goes further than premedical grades in ranking men. It has an advantage similar to that of the national board examinations over the average state board examinations.

FIRST YEAR PERFORMANCE AT VARIOUS TEST SCORE LEVELS

Obviously, if the aptitude test can help to predict the success or failure of a man in the freshman year it is valuable. It is during this year that most men fail. We have, therefore, made a special study of freshmen grades in the different classes. On the other hand, if men survive this year, they will usually get by during the remainder of the course. At Vanderbilt, the aptitude test has never been required. Nevertheless, it has always been advised and in many doubtful cases has been insisted on. I feel that while it is an excellent index of a man's fitness to succeed in medical school, it should obviously not be regarded as a sole criterion by which he should be judged, any more than an x-ray alone should be considered an adequate basis on which to make a final diagnosis.

For the use of the Committee on Admissions at Vanderbilt University, thirty charts have been prepared from the available material, to show the various correlations for individual classes. For purposes of publication, these have been condensed into four summary charts, to which reference is made later. In general, it may be said that, with few exceptions, good correlations were recorded for the aptitude test scores and records in the freshman years even when so few students are considered as the members of one medical class.

FIRST YEAR PERFORMANCE AT VARIOUS PREMEDICAL GRADE LEVELS

Obviously, it has been and should be the custom of admission committees here and elsewhere to give considerable weight to a student's general average in all premedical work, both in scientific and general subjects. The fact that premedical grades have often utterly failed to predict accurately a student's worth has often proven disappointing and has led committees on admissions to cast doubt on the standards of certain institutions. Obviously, an "A" in certain colleges may be the equivalent of a "B" or "B—" in others. This fact has led us to keep a file which shows how men from different institutions with similar grades perform in medical school. Such a list has been very helpful to us in deciding upon further admissions and to the colleges in remedying weak spots in their curricula or in improving their grading systems. In this paper I shall not have enough space to devote to a detailed study of this subject, even though it is very interesting. I do feel, however, that it is very important to determine how well premedical grades correlate with first year medical averages. A study is, therefore, presented of the same students comprised in the study of the aptitude scores. This study covers the same period of years. The usual letters from "A" to "C" are employed to express the premedical averages. It is unfortunate that eight groups of grades result from this division instead of ten, since the

latter would facilitate a comparison with the decile groups of the aptitude test. Regardless of this, however, accurate comparisons may easily be made, since the medical averages are expressed in percentages.

In individual charts for each class we have studied the correlation of premedical grades with medical averages for the freshman year. This study has comprised two sets of figures—the one for the premedical grades in science, viz., chemistry, physics and biology with the first year grades; the other, the general premedical averages (including science courses) with first year grades. A negligible difference is noted between these two sets of correlations. The class of 1936 showed the best correlation of any studied. In this class, the "A" men ranked at the top the freshman year, while the men in the "C—" group ranked lowest. The freshmen grades between "A" and "C—" are spread from 90 to 76.40 per cent. In general, the correlations are disappointing; many failures appear in the upper premedical grade levels; in fact, a majority are found there and almost none in the lower grade levels. In the class of 1933, one man with an "A—" general average and another with a "B" average in science both failed while one with a general average of "C" ranked in the middle third of the class in his freshman year. The spread of grades from the "A" to the "C—" students, with the exception of those for the class of 1936, is insignificant in contrast with the spread from the first to the tenth decile of the aptitude test.

An accurate idea of the relative merits of aptitude test scores and premedical grades in predicting success in medical school may be arrived at by a consideration of these factors for five classes, each over a four year medical school period. Hence, this material is included in detail.

FOUR YEAR PERFORMANCE AT VARIOUS APTITUDE TEST SCORE LEVELS

In the remaining descriptions the word "correlation" is employed to mean the relation at any level between aptitude test score and grades for four years.

One chart shows an excellent correlation for the members of the class of 1933 at the various aptitude test levels. The highest decile actually averaged 88.9 for four years. The men in the lowest two deciles, or lowest fifth, failed.

Another chart shows a weeding out of the poorer students in the earlier years which resulted in the lower four deciles of test scores approaching a mean level. It is a point against the predictive value of the test that the grades for the seventh and eighth deciles of test scores of the class of 1935 are somewhat lower than those of the ninth and tenth. Perhaps, this may be explained by the fact that the men who show the poorer grades in the first two years are warned each trimester. After warning such men, one of two things may happen. They may fail and leave school, or they may work harder and improve their grades to a point somewhat above those who are in the higher deciles but who have not been warned. This supposition seems to be borne out in the case of the class of 1935.

Another chart shows this class to have an average of about 82 to 83 in the lowest three deciles.

There are no men in the tenth or lowest decile.

Exactly the same fact obtains in the case of the 1936 class. Here we find an excellent correlation in the upper groups but a rather insignificant degree in the lower five.

Another chart representing the four year performance of the class of 1937 presents a better correlation in all of the nine deciles represented than does any, except that for the class of 1933. The better students rank at the top, the lowest in the ninth decile of test scores.

FOUR YEAR PERFORMANCE AT VARIOUS PREMEDICAL GRADE LEVELS

The chart which we have prepared for the class of 1933 shows that the premedical science grades have a very poor predictive value over a period of four years. A failure occurs in the A— and B+ groups. From A to C+ the maximum difference of grades is only 4.4 points. The only men above 90 at the end of four years were in the B and C+ groups. The same degree of correlation holds for general premedical averages. The many withdrawals were due to extracurricular causes, such as voluntary transfer to other schools.

As seen in the charts prepared for the class of 1934, the predictive value of premedical grades, while slightly better than in the case of the class of 1933, still leaves much to be desired. The spread of grades from A to C— is very slight.

For the class of 1935, the correlations between premedical grades and standing is so slight at the different levels as to be insignificant. For the general premedical grades, the "C" men stood higher than the "A" men, while no group differed from any other by more than 3.9 points. The latter also holds for the science grades.

A better, although a not very good, correlation, is found in the charts which refer to the class of 1936. There is a greater maximum difference of grades and more of the A and A— men ranked high. Here, again, however, the B— group ranks above the C— group.

The correlations are also not very significant for the class of 1937.

To summarize the data presented by the charts for the various classes, we conclude that the predictive value of premedical grades, both scientific and general, is fair in the case of certain classes and poor in certain others. In none does it seem significant enough to be used as a sole and presumptive index of a man's likelihood to succeed in medical school.

In this connection I wish to state that Dr. Edward S. Thorpe, Jr.,[3] assistant dean at the University of Pennsylvania School of Medicine, voiced an opinion in 1937 that I have long held. He says, "I have felt that a good student in

3. Thorpe, Edw. S., Jr.: Relative Value of Cultural Courses in Premedical Training. J. A. Am. M. C., 6: 79 (Mar.), 1931.

Chart 1.
Four Year Medical School Performance at Various Premedical Grade Levels
Science Courses
Classes 1933-1937 Inclusive

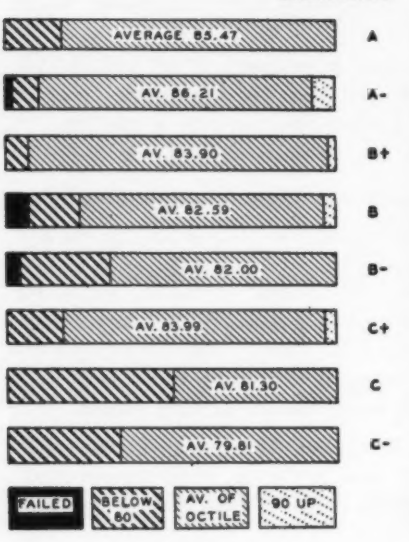


Chart 2.
Four Year Medical School Performance at Various Premedical Grade Levels
General and Science Courses
Classes 1933-1937 Inclusive

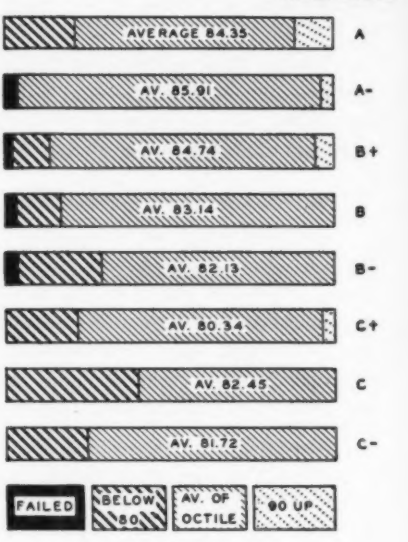


Chart 3.
Four Year Medical School Performance at Various Aptitude Test Score Levels
Classes 1933-1937 Inclusive

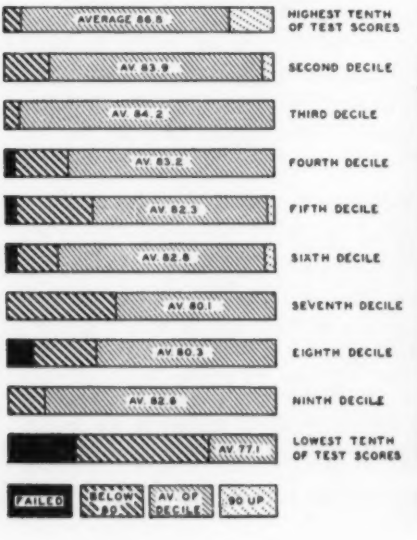
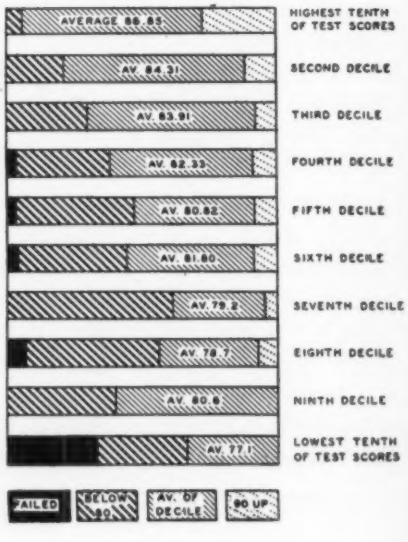


Chart 4.
First Year Medical School Performance at Various Aptitude Test Score Levels
Classes 1933-1937 Inclusive



college will usually turn out to be a good student in medical school and later be a good physician regardless of the exact type or content of his preparation."

He showed that students who have taken from 20 to 34 per cent of credits in science while fewer in number stood higher in greater proportion (38 per cent in the upper quarter of the classes from 1926 to 1930) than did either the students who had taken from 35 to 49 per cent of science (17 per cent in upper quarter) or those who had taken more than 50 per cent in science (21 per cent). It may later prove profitable to analyze the medical grades of our students from the viewpoint of the proportion of science to so-called "cultural" subjects. In this study we have only considered the relative predictive values of scientific and general grades in the premedical course including those in science subjects.

Since, with rare exceptions, the premedical science grades and general grades in our series have corresponded within close limits, we would not have expected much difference to be noted between the two sets of charts for the various classes. Such is the case.

SUMMARY CHARTS

Charts 1 to 4 inclusive constitute the results of attempts to determine the degree of correlation between the criteria of premedical grades and test scores with the medical grades of all students in the five classes studied.

In spite of the premedical grades falling into eight groups and the test scores into ten (deciles) they may, nevertheless, be compared quite closely. For example, we may draw a middle line both in Chart 1 for premedical science courses and Chart 3 for aptitude test scores. These two charts, then, show three failures for the upper half of the premedical science grades, only two failures for the only two failures for the aptitude test scores. Conversely, in the lower halves of the charts there are only two failures for premedical science grades and three for the aptitude scores. In the lowest three brackets, where failures would be expected, premedical grades predicted none while aptitude test scores predicted two..

These same figures hold, in the main, for the general premedical averages shown in Chart 2 in comparison with the same aptitude scores in Chart 3. The one exception is that four of the five failures in the case of the premedical grades fall in the upper half—a point against the predictive value of the premedical grades as a sole criterion.

Again, comparing these charts it is seen that the premedical grade "A" groups, both general and scientific, do not rank as high as the highest decile of test scores over a four year period. There is a far greater proportion of men below an 80 average and fewer men above 90 in the former group than in the latter. This point holds true for the premedical science grades in comparison with the aptitude test scores. It is also true for the "A—" group of premedical grades compared to the second decile of test scores.

Premedical averages also give a poorer correlation in the lowest or the "C—" group than does the tenth, or lowest, decile of the test scores. For the former, we have a four year average for the general grades of 81.7 and for the premedical science grades of 79.8, with no failures recorded. For the latter, or test scores, there are 73 per cent under 80, an average of only 77.1, and 25 per cent of failures.

While the intermediate groups in both show good correlation, with few exceptions, yet the maximum difference of grades for the premedical averages is much less from A to C— than is the maximum difference of grades between the first and tenth deciles of aptitude test scores. This difference is only 2.6 points and 5.6 points for the general and the scientific averages respectively, and 9.7 points for the aptitude test scores. Applying Dr. Moss' methods of study to our charts with regard to the predictive value of the test we may state: If a student has an aptitude test score as high as the upper tenth of those tested, according to our figures, the chances are 100 per cent that he will pass all four years of his work, 17 in one hundred that he makes a four year average of 90 or above, and approximately 98 out a hundred that he will make a four year average above 80.

On the other hand, if he is as low as the lowest decile, the chances are about 33 out of a hundred that he will fail by the end of his first year and 75 out of a hundred that his grades will average under 80 by graduation if he should happen to remain in school.

If a student ranks in the upper three tenths of test scores: The chances are 100 per cent that he will pass all four years of his work, seven in one hundred that he will make a four year average of 90 or above, and about 93 in a hundred that he will average above 80 at the end of four years.

On the other hand, if his score places him in the lowest three tenths: The chances are about 13 out of a hundred that he will fail during his freshman year and about 40 out of a hundred that he will average below 80 at graduation. The chances are also about 51 out of a hundred that he will average below 80 in his studies by the end of his freshman year if he should not fail.

If a man ranks in the middle two tenths of test scores: The chances are about 7.5 out of a hundred that he will average 90 or above at the end of his freshman year and about 46 out of a hundred that he will rank below 80 his freshman year. The chances are also approximately 4 out of a hundred that he will fail.

The contrast between these correlations for aptitude test scores and those given by the premedical science and general averages is very marked. Considering, first, the premedical science grades as a criterion (Chart 1), we may conclude: If a man makes a premedical science grade in the upper fourth of grade groups, in other words, a grade of A or A—: The chances are about 13 in a hundred that he will make a four year average below 80, and 7 in a hundred

that he will average above 90. Also the chances are about 1 in a hundred that he will fail. The proportions run closely parallel for the corresponding general premedical grades.

If a man averages as low in premedical grades as the lowest three eighths of grades, in other words, as C: The prediction from the charts would be that he would not fail in a single instance. This holds both for the general and science premedical grades. Obviously, the low grades presented have little, if any, predictive value, except in predicting that a high percentage of these low groups will average below 80. About 33 1/3 out of a hundred in these low groups will make this low an average throughout the four years of medical school.

On the other hand, almost this same percentage of students in the middle quarter, viz., B and B— (about 32 out of a hundred) will make an average grade below 80 and about 4 out of a hundred will fail, according to the prediction of Charts 1 and 2.

Considering again, briefly, the predictive value of the aptitude test scores, I feel that it is only fair to say that Chart 4 illustrates the very definite and, therefore, valuable manner in which the aptitude test scores predict the performance of men in the freshman year, a prediction which also holds true for the four years. Here, as shown, the average grades are found to be progressively lower and lower from the highest to the lowest deciles, tapering down very gradually from 86.85 to 77.1 per cent. The shaded portion representing the men who made 90 per cent or above diminishes quite uniformly downward from the top; the "below 80" grades increase in number from above downward. The low percentage of failures, which is seen to start in the fourth decile from the top, reaches a high percentage in the lowest decile of test scores.

Such gradations indicate a splendid degree of correlation between test scores and grades and a high predictive value for the test: Considering the small number of students available for study of the test at any one university, this degree of correlation at Vanderbilt is very gratifying. It may possibly be interpreted to indicate that the system of grading in the medical school is fundamentally sound.

In the various years certain cases of discrepancy between the aptitude test scores and medical grades have arisen. These will always occur. They have been made the subject of special study by members of the Committee on Aptitude Test on which I have served. This study showed that the test cannot take account of certain factors like the development of poor health, lack of social adjustment, financial difficulties. It cannot predict that a student will engage in too many social activities or develop difficulties in his medical work due to a foreign accent or desire to study law or another profession. On the other hand, it may give too low a prediction if a man should happen to make excellent grades in medical school as a result of his association with a laboratory partner who ranks in the first decile or of his maturing and "finding himself." The

human element will always cause exceptions, but may we not logically conclude that these prove the rule!

In conclusion, while out studies show that premedical grades are not as good a criterion as the aptitude test in predicting the success of students at Vanderbilt, I feel that they are, nevertheless, valuable and will become more so as certain colleges improve their courses and grading systems. It is my opinion that in choosing between so many men for so few available places every criterion which has any predictive value should be taken into account. It is perfectly certain that the personal rating forms, premedical grades and aptitude test scores, when considered together, will give a more accurate prediction of a man's worth than will any single criterion or any two criteria.

One must realize that when all is said and done by the admissions committee certain students may later defeat all predictions. The human make-up cannot always be taken completely into account. William Sydney Thayer was expelled from Harvard because of a boyish prank. Had it not been for the sympathetic efforts of an old English clergyman whose pupil he became it appears quite certain he would not have been allowed to enter medical school. In the effort to play safe for the student and the school it is to be hoped that no Parés and no Oslers will be excluded.*

* I wish to thank Dr. Moss for furnishing some of the material for this study and Mrs. Ellison for valuable aid in the preparation of a portion of the statistical material in the charts.

History of Medical Education
The First Graded Curriculum

FRED C. ZAPFFE

Secretary, Association of American Medical Colleges,
Chicago, Illinois

At the fourth annual meeting of the Association of American Medical Colleges held in San Francisco, California, June 6, 1894, Dr. Nathan Smith Davis, dean of the Chicago Medical College (now Northwestern University Medical School), president, appointed the following Committee on Syllabus to prepare a course of study for the four years course which was to become effective for the academic year 1895-1896:

Dr. Phineas S. Conner, Medical College of Ohio.
Dr. Victor C. Vaughan, University of Michigan College of Medicine and Surgery.
Dr. Wm. E. Quine, College of Physicians and Surgeons, Chicago (now University of Illinois College of Medicine).
Dr. N. S. Davis, Jr., Chicago Medical College.
Dr. Chas. B. Stemen, Fort Wayne College of Medicine.

This committee reported a curriculum, the first of its kind to be set up, which was adopted the following year. It provided for a limited amount of instruction in a laboratory (aside from the dissecting room) and also a small amount of "clinical instruction." No mention is made where the clinical instruction was to be given, but in all probability it consisted of "showing" patients in the lecture amphitheater or in the outpatient department then in process of establishment. This was then known as the "dispensary."

The "year" at that time was of six months duration. Previous to this time, the curriculum was marked by many yearly repetitions of various subjects. The so-called "specialties" were just beginning to appear. "Paedology," diseases of children, was a wholly new subject. One wonders how the teachers in the specialties made use of their time, the subjects being of comparatively recent introduction in medical teaching. The preclinical sciences were all taught by practitioners, except chemistry, which usually was taught by a pharmacist. Teaching in physiological chemistry consisted, in the main, of a course of lectures based on Halliburton's Physiological Chemistry, the only text extant at that time, and a few test tube demonstrations of the action of pepsin on egg white. Medical jurisprudence always was taught by a lawyer and was rather a "stiff" course.

Medicine was taught entirely by means of lectures and quizzes, except for the 25 hours of clinical instruction. But, on the whole, the teachers in this branch were among the best practitioners, men with a reputation, and thoroughly imbued with the love of teaching. No attempt was made to cover the entire field, but such diseases as typhoid, pneumonia, tuberculosis and syphilis were

stressed, with the remaining time devoted to a discussion of diseases which the practitioner would be most apt to meet in his practice.

About one third of the scheduled 2,465 hours of the total course were given over to anatomy, chemistry, materia medica and therapeutics. Therapeutics was well taught in those days. True, there is more to teach in this field today than there was in 1895, but proportionately more time was given to the subject then than is the case today. Besides much of the teaching in general medicine consisted of treatment. The same can be said of the subjects of hygiene and state medicine. There is a distinct change in concepts between the then and now.

SUBJECT	HOURS: Didactic Recitation	HOURS: Laboratory
Histology and Embryology	50	100
Anatomy and Physiological Chemistry	150	300
Physiology	200	75
Chemistry: Inorganic and Organic	125	125
Materia Medica and Therapeutics	125	
Practice	200	
Surgery	200	50
Regional and Operative Surgery	50	
Obstetrics and Gynecology	150	
Ophthalmology and Otology	25	
Mental and Nervous Diseases	25	
Dermatology	25	
Bacteriology	25	150
Pathology	50	100
Physical Diagnosis	75	
Paedology	25	
Medical Jurisprudence	15	
Hygiene and State Medicine	50	
Genito-Urinary Diseases	25	
Orthopedic Surgery	25	
Laryngology	25	
Clinical Instruction	25	
	1665	800

Bacteriology was a comparatively new science, yet it was allotted 175 hours. Of course, a great deal of this time was spent in the preparation of culture media. Little, if anything, was known of immunology and serology. Stress was laid on the biology, morphology and identification of bacteria, staining the tubercle bacillus and the diphtheria bacillus. Much time was spent by the student in culturing the diphtheria bacillus and the typhoid bacillus as well as many nonpathogens, notably the hay bacillus. It is probable that he came out of this course with a wholesome respect for bacteria in general and a fairly good grounding in their relationship to disease. There were still many scoffers at the idea of bacteria causing disease in man. Some of these predicted that some one would discover a bacillus which caused fractures in bones!

Pathology was also one of the youngest of the sciences represented in the curriculum. Mounting sections consumed the major portion of the time allotted for laboratory instruction, although the didactic work covered the subject thoroughly as far as it went at that time. General pathology was well taught be-

cause men had already begun to specialize in pathology, doing a considerable amount of autopsy work. A few men in the country were outstanding in this field as early as 1895.

Physical diagnosis was very well taught in those days. The students used one another as subjects and were forced to master the subject almost entirely by examining normals. They did not come in contact with patients at all or only in a very limited degree. Occasionally, a patient would be brought to the amphitheater to demonstrate heart murmurs, räles and various forms of respiratory aberrations. But, they did get a thorough grounding in all of the fundamentals of physical diagnosis. The teachers in this field were hopeful of sooner or later being promoted to the teaching of general medicine.

Comparing this curriculum with the one in vogue now, it is evident that much can be learned from it which could be made use of today. The continued making of changes is bound to cause some "falling by the wayside," especially when additions must be made, but in making changes, one should always be mindful of fundamentals and that time cannot be stretched. Time, as well as the importance of a subject, should determine what can be taught as well as what should be taught. In 1895, what was known in any field was stretched to fill in time. That need no longer be done.

The members of this Committee on Syllabus were all well known teachers of experience, men with a reputation as teachers and practitioners, men who were giving much thought to medical education and who were fully abreast of the times so far as advances in medicine were concerned. Therefore, they did a very good piece of work in setting up this curriculum.

Chemical Psychiatry

Don't think the man who hunts for whale
Must be a fearless giant,
Or that it's a mark of courage
To shoot down an elephant.

Nor think that science is but used
To render help and service,
For powder's use is much abused,
And drugs that cure can kill us.

There was a time, it is a fact,
Whale hunters needed courage,
But science with its devilish tact
Has changed the game to pillage.

The living mountain still may spout
Brilliant rainbows in the air
Yet cause no thrill, just mark the spot,
For an abbatoir affair.

The crock of gold at the rainbow's end
Is a pleasant fairy tale,
The crock of gold, mined from a whale,
Is a tainted ghoulish grail.

But if we seek a substitute
To replace the whaling game,
There's one with every attribute
To be worthy of acclaim.

It is to catch the breath of one
Cocktailed until he's mellow
And isolate the spirit from
The spoutings of the fellow.

A spirited game to follow,
And from what he will exhale,
You can see just why a minnow
May believe he is a whale.

By using well the distillate
From breath or body fluid,
The tests will differentiate
'Tween Bacchus and the druid.

And if perchance the judge should ask
Just how much the man imbibed,
The breath or blood will tell a tale
With the answer quite implied.

It's not a dull landlubber's game
With its tides of mystery;
We'll call it, if you wish a name,
Chemical Psychiatry.

—H. A.

JOURNAL
OF THE
Association *of* American Medical Colleges

Volume 13 NOVEMBER, 1938 Number 6

Citizenship for Licensure

Elsewhere in this issue is reprinted the resolution adopted by the House of Delegates of the American Medical Association at the San Francisco meeting (1938) calling on state medical licensing boards to consider adoption of a requirement of full citizenship of foreign medical graduates before they can take a licensing examination.

This is an important resolution, one which should receive the thoughtful consideration of every state licensing board. It is fair and just. The political racial conflict which has existed in certain countries of Europe is forcing many physicians of these countries to seek asylum abroad, especially in the United States. Despite the fact that most of these men are practitioners of high standing, some with an international reputation, it is necessary to curb the influx of physicians to this country where it has often been said there are too many physicians in proportion to population. Furthermore, license to practice in the foreign countries concerned is restricted to citizens of these countries; therefore, we would be remiss in our loyalty to our country if we failed to uphold similar ideals of citizenship in the administration of medical practice acts. There is no reason why he who makes his living in any country should not be a citizen of that country, and the high ideals and ethics of the medical profession should be paralleled by an equally high degree of patriotism.

Already many state licensing boards have adopted regulations governing the admission to practice by graduates of foreign medical colleges. Intern service is similarly protected. Why not medical practice? These rules are not unfair nor is it impossible to meet the requirements. They do not prohibit. They are merely protective.

◆ ◆

Distribution of Physicians

Much has been said about the unequal distribution of physicians. Some medical colleges have done something to overcome this with the help of student loan funds. But, on the whole, a graduate may locate wherever he chooses and too often the choice is a large medical center. The smaller cities, villages and hamlets, the sparsely settled sections of the country, are without medical aid within their borders despite the fact that many of these locations offer splendid opportunities for an ambitious, competent young physician. Recently, the cashier of a very small community asked for help in getting a physician to locate there, stating that he could easily earn at least $10,000 a year! Another small community in a corner of one of our very sparsely settled states offered a surety of $4,000 a year to a competent physician and stated that he should be able to earn at least $12,000 a year if he was "the right sort." Other similar instances could be cited, but to what purpose? It is next to impossible to persuade a young physician to take advantage of these exceptionally fine opportunities.

It is reported that the government of Poland has passed a law aiming at supplying physicians to small communities. The law requires every new physician to practice in towns and villages of less than 5,000 inhabitants for two years before he can settle in a larger city. Germany has a similar restriction. Some

of the larger cities are "closed" to practitioners for the time being—Hamburg, Berlin, Munich. The existence of a vacancy in any district determines whether a physician can settle in that district. The government supervises distribution of physicians in every particular and it is obligatory for the physician to conform to its regulations. Would that distribution of physicians were possible in this country.

◆ ◆

Graduates for 1938

The final and complete returns on the number of students who completed their four years of work at the end of the academic year 1937-1938 places the number at 5,120. Some of these students must complete the internship before they will be listed as having received the degree of M. D., but all have completed the prescribed course of study satisfactorily. The figure for 1937 was 5,215; for 1936, 5,199. Most of these students began the study of medicine in 1934; some before that date; a few later, having been in continuous attendance, hence completing four courses of study in three calendar years.

The entering class of 1934 was the largest class in the history of medical education in the United States. The size of the class gradually dwindled. Only 76.6 per cent of the original entrants came through in 1938, as against 78.4 per cent in 1937 and 80.5 per cent in 1936.

◆ ◆

To the Editor,
Journal of Assoc. of American Medical Colleges,
5 South Wabash Ave.,
Chicago, Ill.

Dear Sir:

This Spring it was necessary to revise a laboratory outline of an elective course in physiology entitled: "Course 305.—The Principles of Physiology as Applied to the Diagnosis of Nervous Diseases and Nervous Lesions."

This course, consisting of 3 lectures and six laboratory hours per week per quarter (3 mos.) was conceived some 26 years ago and has been given yearly ever since. Possibly because it is a professional ("trade") course, it has enjoyed an unexpected popularity; for fully 60%+ of all second year medical students have elected it every year, after it got under way, even when scheduled during the wintry months at the early hour of 6:50 A. M. (Dawn Patrol Class, it was once called). Parenthetically, I might remark that, as far as I can ascertain, no similar course is given elsewhere, here or abroad.

In the course of the revision of the laboratory outline, it occurred to me to include some prefatory statements on the nature and scope of the course as well as some general reflections on the qualifications for teachers *in medical schools*—meaning, of course, the men or women who are entrusted with the instruction of medical students in the preclinical sciences.

This was done. More might have been written than appears on the attached sheets. But what I have written sufficed to elicit expressions of approval by some of my colleagues as well as sharp dissent from others.

On receipt of the recent issue of JOURNAL of the Association of American Medical Colleges it occurred to me to submit the statements to you for your consideration of the advisability of publishing this letter and the attached "document" in the JOURNAL for possible comment or criticism. If this is agreeable to you, may I ask that all communications sent you or me by the readers be signed.

Faithfully yours,

(Signed) ARNO B. LUCKHARDT,
Professor of Physiology,
University of Chicago.

Physiology Course No. 305

This course (comprising lectures and laboratory work) is designed primarily for the *medical student.* Those without a medical education, who are or

will be entrusted with the teaching of medical students, ought to acquaint themselves with its content. The author claims no particular originality in outlining the course. Numerous students, who have profited by it in the past, have in turn recommended it to the succeeding student body.

The course purposes to bridge the gap between pure neuro-anatomy, general physiology of the central nervous system, and clinical neurology. It does not attempt to encompass clinical neurology or even to discuss specific clinical neurological diseases or syndromes. It does, as the course states, involve the "Principles of Physiology as applied to a Diagnosis of Nervous Diseases." It, therefore, attempts to correlate scientific neuro-anatomy with known physiology of the central nervous system in order to explain the signs and symptoms of disease in *physiological terms*. When clinical neurological syndromes are mentioned, the object is twofold: (1) To illustrate the physiological basis of the syndromes; and (2) To enliven for pedagogic purposes the discussion, so that the student audience will appreciate the significance in terms of every day clinical experience.

The author is one of the very few in the preclinical sciences who believes that any ascertained fact is, or will be found ultimately to be of a *practical* value to humanity. Not that he is adverse to the solutions of problems of an *apparently* purely academic nature. On the contrary, his bibliography contains many of the latter type. But he would consider his life misspent and animals needlessly sacrificed if the results of his investigations (presumably factually accurate in a general way) did not ultimately conduce to make the life of man and animal more comfortable. Thoughtful experimentation initiated by observed facts yields results which in turn, when thoughtfully evaluated from the point of view of the implications, stimulates to further experimentation.

The teacher of medical students should have had a medical education either before or after a training in his particular specialty. Even a general survey of the medical field (obtainable at any medical school worthy of the name) will aid him or her in the choice of topics for didactic presentation; in a better appreciation of the respective values of the material to be presented to insure balance; protect the "Professor" against the crudest of serio-comic blunders in the cognate sciences of anatomy, physiology, bacteriology, pathology, etc., about which he should know more but usually knows less than the class before him; and guide him or her in the prosecution of research, ever alert because of general knowledge to follow those leads the solution of which might suggest prophylactic measures, practical hygienic and physiological methods or a better therapy.

At any rate, this is my confession of Faith based on observations and experiences over a lifetime as a teacher in a medical school. Many of my associates will disagree thoroughly with this point of view when they or their families are well. Until adversity in the form of disease strikes home, one hears vaporings aplenty about pure and undefiled *science* and the importance of research conducted solely on *fundamental problems*. This "philosophic" mist is forgotten promptly at the bedside of a loved one who is acutely ill, and the definition of a fundamental problem assumes then a more decidedly *practical* complexion. On that occasion will those disagreeing with me consider seriously the words of Hermann v. Helmholtz who, at the age of 56, wrote as follows:

"Perhaps only he can appreciate the immense importance and the fearful practical scope of the problems of medical theory, who has watched the fading eye of approaching death, and witnessed the distracted grief of affection, and who has asked himself the solemn questions, Has all been done which could be done to ward off the dread event? Have all the resources and all

means which Science has accumulated become exhausted? • • •

"Medicine was once the intellectual home in which I grew up, and even the emigrant best understands and is best understood by his native land." (On Thought in Medicine, 1877).

ARNO B. LUCKHARDT.

◆ ◆

The Syracuse Meeting

The Forty-Ninth Annual meeting of the Association of American Medical Colleges, held in Syracuse, New York, October 24-26, 1938 passed into history, but it established a new high record in many ways which will mark it as a definite milestone in the history of the Association.

The local arrangements were as perfect as anything can be. The local committee on arrangements, the members of the faculty of Syracuse University College of Medicine and their wives left no stone unturned to make the visit to Syracuse one long to be remembered. Every one present expressed himself clearly as having had "the time of his life." Even the hotel management came in for a share of praise, which it richly deserved. "Hitches" were conspicuous by their absence despite the unusually large crowd present.

The program was well received. Each paper was listened to attentively and attendance was sustained until the moment of closing. It is not possible to mention the "best" paper because each paper was deserving of praise. Each one had a definite message to impart and contained much which should give raise to careful thought and even action by the medical schools. The papers and discussions thereon will be published in the JOURNAL of the Association of American Medical Colleges as speedily as possible.

The attendance was the largest of record. Seventy-seven member colleges were represented; seven were not represented. Nearly 150 delegates from these colleges registered. The total registration exceeded 200. The dinner on Monday evening was attended by 262 persons· the executive dinner by 122 delegates. Some delegates were obliged to leave before the executive session.

Syracuse may well be proud at having established such a fine record and feel that it did full justice to the occasion. The thanks of all present are extended in hearty sincerity.

◆ ◆

Association of American Medical Colleges

Officers for 1938-39: President, Dr. Willard C. Rappleye, Columbia University; New York City; president-elect, Dr. Russell H. Oppenheimer, Emory University, Atlanta; vice president, Dr. Waller S. Leathers, Vanderbilt University, Nashville; secretary, Dr. Fred C. Zapffe, Chicago; treasurer, Dr. A. C. Bachmeyer, University of Chicago. Members of the Executive Council (newly elected), Drs. John P. Bowler, Dartmouth College, Hanover, N. H., and Stanhope Bayne-Jones, Yale University, New Haven, Conn. Holdover members, Drs. Maurice H. Rees, chairman, University of Colorado, and Dr. Loren R. Chandler, Stanford University. Other members of the Executive Council are the officers except the secretary and treasurer who are ex officio members.

The Association voted to endorse the formation of a National Council on Medical Education, Licensure and Hospitals and appointed three representatives to attend an organization meeting to be called by the president of the Association. These representatives are: Dr. Willard C. Rappleye, Dr. Maurice H. Rees and Dr. Wm. S. Middleton. Thus far, ten or eleven national organizations representing medical education, licensure and hospitals have expressed interest in the formation of such a council. Some have already appointed representatives to the organization meeting.

Cincinnati, Ohio, was selected for the

place of meeting in 1939. This will be the semicentennial meeting of the Association and should be at least the equal, if it will not outdo, the Syracuse meeting. The time of the meeting will be October 23, 24 and 25, 1939.

◆ ◆

National Cancer Institute
Training in Cancer Diagnosis and Treatment

The School of Medicine of Western Reserve University has been accepted by the National Cancer Institute as one of the centers for the training of physicians in the diagnosis and treatment of cancer. All the appointments are filled at the moment, but as vacancies may arise, those who are interested should apply promptly to the Surgeon General, United States Public Health Service.

Appointments at this School are for two years, and include eight months of pathology, eight months of radiology, and eight months of surgery, under the general direction of Doctors Freedlander, Pomeroy and Lazzari of the Tumor Clinic at City Hospital.

Applicants must have had at least three years of hospital training, one of which may have been a rotating internship, but two years at least must have been surgical.

Not more than one trainee can be accepted at present, but this may gradually be increased to three.

Trainees will be paid by the National Cancer Institute on a per diem basis out of which they will be expected to pay all of their necessary expenses, including tuition, if any is charged by the institution which accepts them for training. Stipends for training will range from a per diem allowance of from $5 to $10, depending on training, experience and other considerations.

Further information and application blanks may be obtained on written request to the Surgeon General, United States Public Health Service, to the Director, National Institute of Health, Washington, D. C. or from Dr. John H. Lazzari, Secretary of the Cancer Training at Western Reserve University, Republic Building, Cleveland, Ohio.

◆ ◆

Fellowship in Pediatrics

A fellowship in pediatrics is available at the Metropolitan Hospital, New York City. Salary, $600 per year; no maintenance. The applicant must have pediatric training, an interest in teaching pediatrics and ultimately there may be an opportunity to become a member of the faculty of the New York Medical College on a part time or full time basis. If the applicant will agree to take a position in the Vaginitis Clinic, he will receive an additional $60 per month.

Applications should be made to Dr. Reuel A. Benson, Director of Pediatrics, 40 East 61st Street, New York City.

◆ ◆

Teachers Wanted

An instructor in pharmacology, $2,500, with ample opportunities for research; an assistant professor of physiology, $3,000, fine research facilities.

◆ ◆

Douglas Talcott Grey

Mr. Grey was dropped by George Washington University School of Medicine at the end of the freshman year 1934-1935 for poor scholarship. He disappeared from the picture until 1937 when he applied for sophomore registration at the University of Wisconsin on the basis of work done at McGill University. The case was a peculiar one but after considerable correspondence, Wisconsin admitted him. However, at the end of the year he was dropped because of poor scholarship.

In 1938 Grey applied for admission to the Medical College of the State of South Carolina seeking junior registration on the basis of very good credentials issued by Wisconsin and a letter of high recommendation from Dean

Middleton. South Carolina apparently became suspicious; wrote to Wisconsin and unearthed the fraud which had been practiced by Grey through these two forgeries. Needless to say he was refused admission.

Later he was reported as having received junior registration in the University of Arkansas School of Medicine. A statement of the case was sent to Dean Vinsonhaler. He charged Grey with fraud; Grey admitted it and was removed from the rolls of the institution. Look out for Douglas Talcott Grey.

◆ ◆

Recent Ruling by
Marquette University

"Every member of the faculty of the Marquette University School of Medicine, who is qualified to join the Medical Society of Milwaukee County and the State Medical Society of Wisconsin, must do so in order to retain membership on the faculty of the Medical School. Every individual who is proposed for appointment to the faculty of the Marquette University School of Medicine, who is qualified to be a member of the Medical Society of Milwaukee County and the State Medical Society of Wisconsin, must present evidence of membership in said County Medical Society and State Medical Society as a qualification for consideration for appointment to the faculty of the Medical School."

◆ ◆

Wisconsin State
Medical Society Awards

The State Medical Society of Wisconsin at its annual meeting in Milwaukee in September presented the Council Award, a gold seal of the society, to Drs. Eben J. Carey, dean, Marquette University School of Medicine, Milwaukee, and William Shainline Middleton, dean, University of Wisconsin Medical School, Madison. Dr. Carey was honored for his "high accomplishments in medical education and research" and for his "perfection of the art and dynamic use of visual education as a means of furthering the health of our citizenry." The seal was awarded to Dr. Middleton, according to his citation: "for accomplishments and lofty inspiration in the teaching of students and practitioners, for your quarter of a century of public service and for your outstanding influence in the development of a high quality of medical service for the citizenry of Wisconsin." The gold seal has previously been awarded to twelve physicians.

College News

Indiana University
Medical Center

The University offers residencies in anesthesia and x-ray. Individuals appointed to these positions will carry the title of assistant residents for one year and subsequent to that date will be known as residents. The x-ray residency carries a stipend of $500.00 plus board, room, and laundry and the anesthesia residency carries a stipend of $400.00 plus board, room, and laundry.

Present plans call for securing a type of individual who will be interested in holding the position for three years in order to meet specialty board's requirements for residencies, but with the reservation that the Medical Center be permitted to renew contracts annually on the basis of performance of the resident selected for the position.

◆ ◆

Columbia University

When the program of graduate medical education was formulated in 1932 the plan contemplated the expansion of the basic medical sciences to provide facilities and instruction in those disciplines as applied to the specialized fields of clinical practice. Completion of the laboratory addition this year makes that part of the program a reality. Another consideration was provision for residencies in the specialties in hospitals affiliated with the University in this plan. It was contemplated that the scheme would ultimately embrace a total of about 150 residencies in the different phases of practice.

The following distribution of residencies is already available in the hospitals cooperating with the University: Dermatology, 33; Internal Medicine, 15; Neurology, 8; Obstetrics and Gynecology, 17; Ophthalmology, 14; Orthopedic Surgery, 23; Otolaryngology, 10; Pathology, 2; Pediatrics, 2; Psychiatry, 9; Radiology, 8; Surgery, 20; Tropical Medicine, 2; Urology, 6. Total, 169.

From the inception of the graduate program it has been clear that a majority of the residents would not register as candidates for the degree of Doctor of Medical Science which, in addition to the minimum clinical experience of three years, has requirements of original investigative work, a thesis, and severe examinations. It has been the aim to restrict the enrollment for the degree to those who are well qualified and desirous of pursuing advanced scientific work in their specialty and to residents who are allowed enough time to carry the program through. Nevertheless, fifty-five students were registered during the year and fifteen were awarded the degree at Commencement.

◆ ◆

University of Vermont
College of Medicine

New members of the medical college faculty are Lieut.-Col. R. L. Cudlipp, assistant professor of clinical surgery; C. S. Leonard, Ph.D., assistant professor of pharmacology; Dr. C. S. Woodall, instructor in neurology; Dr. A. H. Fogg, instructor in physical therapy; Dr. M. L. Hobbs, instructor in medicine; Dr. L. L. Robbins, instructor in pathology; J. E. Davis, Ph.D., instructor in pharmacology and physiological chemistry. Three new laboratory instructors in physiological chemistry are W. J. Simcox, A. B. Meservey, and P. E. Froeschle. Prof. Hovey Jordan of the department of histology and embryology has returned.

◆ ◆

University of Oregon
Medical School

A gift of funds has been made by Mrs. Julius L. Meier and her family in memory of the late Gov. Julius L.

Meier. The initial gift amounts to $50,000, and will be added to funds for construction of the new University State Tuberculosis Hospital to be built on the university grounds. The legislature appropriated $110,000 and the PWA allotted $90,000 for the hospital; the added $50,000 will make possible construction of forty beds in addition to the thirty-nine originally planned. It will also make possible better outpatient facilities, it was said.

The Medical School received a deed to 171.67 acres of land in Lane County as a gift to aid in the prosecution of research. The tract consists of farm land situated about one mile west of Eugene, valued by the owners at approximately $30,000. Under the stipulations of the gift, income from the property is to be devoted to research in cancer and heart disease.

A laboratory building and a library with an auditorium are to be built immediately. A PWA grant of $163,000 was approved. This grant augments a gift of $100,000 from Dr. John E. Weeks, of Portland, and a grant of $100,000 from the Rockefeller Foundation. Plans call for a library building of reinforced concrete, containing an auditorium, track rooms, reading rooms, study rooms and a lobby. It will be connected by a passage with the three story laboratory building, which will be an extension of the west wing of the medical school.

◆ ◆

University of California
Medical School

Through the generosity of the Rosenberg Foundation of San Francisco, the University of California is to be equipped with a laboratory for the study and control of sylvatic plague. This work will be carried on by Dr. Karl F. Meyer, Director of the George Williams Hooper Foundation of the University, assisted by the members of his staff.

Dr. Mary F. Montgomery, assistant clinical professor of surgery, died on August 30 after a long illness.

Dr. Philip Manson-Bahr, director of the Clinical Division of the London School of Tropical Medicine addressed students and staff of the Medical School recently. Dr. K. K. Chen, professor of pharmacology of the University of Indiana, gave a talk on some of his recent work on digitalis-like bodies.

Dr. Carl L. A. Schmidt has been appointed a member of the Committee on the Chemistry of Proteins of the National Research Council.

Dr. Stanley H. Mentzer was decorated by the King of Sweden with the Order of Vasa, first class, for medical philanthropic work among the Swedish people of San Francisco.

Dr. Harold Blum recently resigned his position as Associate Professor of Physiology.

◆ ◆

New York Medical College

Dr. Reuel A. Benson has been promoted to professor and head of the department of pediatrics succeeding Dr. Jeremiah T. Simonson who has retired. James W. Benjamin, Ph.D., has been appointed professor of histology, embryology, and neuroanatomy. Dr. Benjamin was assistant professor of zoology at Northwestern University. Dr. David Scherf has been appointed associate clinical professor of medicine. Dr. Scherf was formerly associate professor of medicine in the University of Vienna in charge of cardiology. Dr. L. Corsan Reid has been promoted to assistant professor of oral and plastic surgery and chief of that service. Dr. C. Michael Witzberger has been appointed instructor in pediatrics.

◆ ◆

West Virginia University
School of Medicine

The erection of a new $250,000 county hospital will increase the facilities for clinical teaching considerably.

University of Michigan
Medical School

Dr. Sprague H. Gardiner, senior instructor in obstetrics, has been appointed in charge of a course of graduate instruction in obstetrics and gynecology. He will serve under the direction of Dr. Norman F. Miller, professor and head of the department of obstetrics and gynecology at the university. The course provides for two weeks of intensive training and observation in obstetrics, gynecology and allied subjects at University Hospital. Two practicing physicians are appointed for each period.

◆ ◆

Medical College of Virginia

Promotions: Dr. Stewart Michaux, professor of gynecology; Dr. R. H. Courtney, professor of ophthalmology; Dr. R. Finley Gayle, professor of neuropsychiatry; Dr. Thomas W. Murrell, professor of dermatology and syphilology; Dr. Lee E. Sutton, Jr., professor of pediatrics; Dr. William D. Suggs, assistant professor of gynecology; Dr. Joseph F. Geisinger, professor of clinical gynecology. Dr. Wyndham B. Blanton has resigned as professor of the history of medicine and has been appointed associate professor of medicine. Professors Emeriti: Drs. St. George T. Grinnan, pediatrics; Emory Hill, ophthalmology; E. P. McGavock, dermatology and syphilology; Charles R. Robins, gynecology; Beverly R. Tucker, neuropsychiatry.

The 101st session began September 19th at 12 o'clock noon.

The Public Works Administration has made a grant of $880,623 towards the construction of a new sixteen story hospital and the rehabilitation of the historic Egyptian Building. The total construction cost is estimated at $1,920,441.00.

The College has received from the estate of the late Bettie Davis Wood securities valued at slightly more than one million dollars. This will be added to the endowment funds of the institution and used for general purposes. This bequest will be known as the Judd B. Wood and Bettie Davis Wood Memorial, named for the late Doctor Wood, a dentist of Richmond, and his wife, who together provided the bequest.

◆ ◆

University of Oklahoma
School of Medicine

Donald B. McMullen, D.Sc., Johns Hopkins University, has been appointed assistant professor of bacteriology. Dr. Hubert E. Doudna has been appointed lecturer in anesthesia and head of the department of anesthesia in the University and Crippled Children's Hospitals. Rudolph F. Nunnemacher, Ph.D., Harvard, has been appointed instructor in histology.

◆ ◆

Hahnemann Medical College

Creation of a department of oncology under the direction of Dr. Stanley Reiman is announced. Dr. Reiman also will occupy the chair of oncology. It is planned to make a profound research of all phases of cancer.

Dr. M. F. Ashley-Montagu has been appointed associate professor of anatomy and research. He was formerly a member of the department of anatomy of New York University.

◆ ◆

Dalhousie University
Faculty of Medicine

The new Medical Library building is now in process of construction. The funds for this project were raised through donations from individuals in large part. This building will house the fine medical library which has until now been scattered in various buildings of the University.

◆ ◆

University of Montreal
Faculty of Medicine

Dr. Joseph A. LeSage, professor of clinical medicine, has been appointed dean to succeed Dr. Telesphore Parizeau who has retired.

University of North Carolina
School of Medicine

A PWA grant of $400,000 has made possible the construction of a new medical building and to enlarge the university infirmary to provide clinical instruction in physical diagnosis. Laboratories will serve the entire university for undergraduate and graduate study. The division of public health will be housed in this building as well as the medical library.

Dr John W. Roy Norton has been appointed professor of public health administration in the division of public health. Dr. Norton was an official of the state board of health — assistant director of preventive medicine.

◆ ◆

Marquette University
School of Medicine

New appointments: Dr. John L. Yates, research associate in oncology; Dr. Roland S. Cron, clinical professor and director of the department of obstetrics and gynecology; Dr. Henry O. McMahon, clinical professor and director of the department of pediatrics; Dr. Clement Fox, instructor in anatomy; Dr. Albert H. Lahmann, assistant clinical professor of obstetrics and gynecology; Dr. Raymond Hershberg, supervisor of students at the Milwaukee County General Hospital; Drs. J. Kenneth Karr, Valorus F. Lang, James P. Conway, Elwood W. Mason and Joseph P. Furlong, clinical instructors in medicine.

Dr. Albert E. Rector, president of the State Medical Society of Wisconsin, spoke on "The Present and Future Status of Medical Practice." Dr. Herbert M. Evans, professor of anatomy and director of the Institute of Experimental Biology of the University of California, Berkeley, spoke on: "Gonadotropic Hormones—A Comparison of those Found in the Anterior Hypophysis, in the Urine of Pregnant Women, and in the Blood Stream of Pregnant Mares."

Plans are under way to offer two week courses in obstetrics regularly throughout the year for Indiana physicians under the auspices of the department of obstetrics, cooperating with the Indiana State Medical Association. It is planned to offer to four physicians at each session an intensive study in obstetrics and pediatrics. While attending the courses, physicians may reside at the Coleman Hospital at the Indiana University Medical Center. There will be no charge for maintenance or tuition during the two week period.

◆ ◆

The Jefferson Medical College

The 114th annual session was inaugurated September 20, 1938. Mr. Robert P. Hooper, president of the Board of Trustees, presided. The introductory lecture was delivered by Dr. Charles M. Gruber, A.M., Ph.D., M.D., professor of pharmacology, on "Research, the Key to Progress."

Dr. Henry K. Mohler, the dean of the college, welcomed the 495 members of the student body. Of this number, 143 are new students, 133 admissions to the first-year class, and 10 admissions to the third year class.

The members of the first year class were prepared for medical study in 62 different institutions; all of them have pursued and completed four years of preliminary and preparatory study and graduated from these institutions.

Announcement was made of the election of Mr. Horace P. Liversidge as a member of the Board of Trustees, of Dr. Bernard J. Alpers as professor of neurology, and of Dr. Miles E. Drake as an additional member of the teaching staff in the department of pharmacology.

◆ ◆

University of Colorado
School of Medicine

New appointments and promotions: Frank R Spencer, M.D., promoted to professor of otolaryngology and head of the department; William C. Black,

M.D., associate professor of pathology, appointed acting head of the department of pathology; George P. Lingenfelter, M.D., promoted to associate professor of dermatology and syphilology; O. Leonard Huddleston, M.D., promoted to assistant professor of physiology and pharmacology; Karl T. Neuburger, M.D., instructor in pathology; Samuel R. Beatty, M.D., instructor in surgery (roentgenology); Fred H. Schultz, Jr., Ph.D., instructor in biochemistry.

Resignations: Howard J. Shaughnessy, Ph.D., associate professor of bacteriology and public health; Bradford J. Murphey, M.D., assistant professor of psychiatry; John D. Benjamin, M.D., instructor in psychiatry.

A building program is now in progress, which includes a new wing to the Nurses' Home, a new wing to the Outpatient Clinic Building, and a new wing to Colorado General Hospital.

◆ ◆

Duke University
School of Medicine

October 13, 14 and 15, Duke University School of Medicine held, in connection with the University Centennial Celebration, a Symposium on Medical Problems. The following topics were discussed: The Future of American Medicine and Diseases of Special Interest to physicians in the Southern States.

New appointments: Dr. Harold W. Brown, professor of preventive medicine and public health; Dr. James P. Hendrix, associate in medicine, and Dr. Hans Neurath, associate in biochemistry.

New York University
College of Medicine

Appointments: Dr. Thomas Francis, Jr., member of the staff of the International Health Division of the Rockefeller Foundation in charge of research on influenza, was appointed professor of bacteriology and director of the bacteriological laboratories of the College of Medicine.

Dr. Edward R. Maloney, associate professor of dermatology and syphilology, was appointed professor to succeed Dr. Howard Fox, who upon his retirement recently was appointed professor emeritus.

Promotions: Dr. Clarence E. de la Chapelle, from assistant professor of medicine to professor of clinical medicine.

Dr. Irwin E. Siris, from instructor to assistant clinical professor of surgery.

◆ ◆

State University of Iowa
College of Medicine

The College of Medicine of the State University of Iowa announces a gift of $22,500.00 from the John and Mary R. Markle Foundation, to be spent over a two year period; $12,500 of the fund will provide for a continuation of the research on inflammatory conditions of the eye in the department of ophthalmology under Dr. C. S. O'Brien, and the remainder will be used to continue the research program on blood clotting and the bleeding tendency in the department of pathology under Dr. H. P. Smith.

General News

Commonwealth Fund Aids Graduate Education

A grant of $37,000 to be disbursed over a period of five years has been given to the University of Minnesota by the Commonwealth Fund, to be used for graduate medical education. The fund will provide a series of advanced courses in at least five branches of medicine.

◆ ◆

Graduate Training in Psychiatry

The Commonwealth Fund has renewed its fellowships for graduate training in psychiatry at the University of Colorado Psychopathic Hospital, Denver. The appropriation covers four fellowships of three years' duration, two beginning in the fall of 1938 and two in the fall of 1939. Dr. Howard P. Gilbert and Dr. Roy M. Finney have been appointed to begin their fellowships in September.

◆ ◆

Wollman Foundation

The William J. Wollman Foundation was recently organized by the executors of Mr. Wollman's estate to administer a trust fund of $5,000,000, which will become available on the death of Mr. Wollman's sister, to be devoted to public charitable, educational and scientific purposes.

◆ ◆

Full Citizenship Requirement for Licensure

The House of Delegates of the American Medical Association at the San Francisco meeting approved a resolution to be submitted to the Federation of State Medical Boards and to the officers of each examining board of the United States with the request to consider seriously the urgent need for adoption of such rules and for legislation necessary for the additional licensure requirement of full citizenship of foreign medical graduates.

The resolution states in full:

WHEREAS, The license to practice medicine and surgery in many countries is limited strictly to citizens of these countries; and

WHEREAS, In addition to holding full citizenship, each applicant is required in several of these countries to show that his medical education was pursued and completed in said countries; and

WHEREAS, Many foreign graduates in medicine and surgery in increasing numbers are seeking admittance to the practice of medicine in these United States; and

WHEREAS, In order to convey adequately to these applicants a full and satisfactory knowledge of the American conception of patriotism and of ethical ideals in medicine, it is necessary that a period of residence be required; therefore be it

Resolved, That in addition to the requirements for foreign graduates, as outlined in a resolution adopted by the House of Delegates for the American Medical Association in 1936, it is highly desirable that an additional requirement of full citizenship in the United States of America be demanded; and be it further

Resolved, That the House of Delegates of the American Medical Association approve the foregoing and that a copy be sent to the properly constituted officers of each examining board of the United States and to the Federation of State Medical Boards, with the request that they consider seriously urgent need for the adoption of such rules and/or legislation necessary to put the purpose of these resolutions into effect.

International Congress of Comparative Pathology

The fourth congress will be held in Rome, Italy, May 15-20, 1939. Dr. H. E. Pietro Rondoni, director of the Cancer Institute and of the Institute of General Pathology of the University of Milan is president of the Congress; Professor Vittorio Zavagli, director of the experimental station for Animal Prophylactics of Rome, is secretary. Professor Nicola Pende is chairman of the section on human medicine; Professor Alessandro Lanfranchi is chairman of the section on veterinary medicine and Professor Lionello Petri is chairman of the section on phytopathology. The headquarters of the secretariat is: Consiglio Nazionale delle Ricerche, Piazalle delle Scienza, Rome.

◆ ◆

Squibb Institute for Medical Research

The firm of E. R. Squibb and Sons has erected a new laboratory building at New Brunswick, New Jersey, at a cost of $750,000 "to create in the medical and biological fields an industry supported research enterprise" to be known as the Squibb Institute for Medical Research. Dr. George A. Harrop, formerly associate professor of medicine at Johns Hopkins University School of Medicine, will be the director and head the division of experimental medicine. Dr. Harry B. Van Dyke, professor of pharmacology, Peiping Union Medical College, will head the division of pharmacology; Dr. Geoffrey W. Rake, formerly with the Connaught Laboratories, Toronto, will head the division of bacteriology and virus diseases, and Erhard Fernholz, formerly of Princeton University, will head the division of organic chemistry. Hans Jensen of Johns Hopkins University will be in charge of the biochemical laboratory and William A. Lott, of Squibbs, will be in charge of the laboratory of medicinal chemistry.

Other appointments are as follows:

Roy O. Greep, Ph.D., formerly instructor at Harvard University, Cambridge, Mass., and Bacon F. Chow, Ph.D., associate professor of biochemistry, Peiping Union Medical College, Peiping, China, to the division of pharmacology.

Arthur E. O. Menzel, Ph.D., instructor in biologic chemistry, Columbia University, New York, and Morris F. Shaffer, Ph.D., assistant in bacteriology, Harvard, to the division of bacteriology and virus diseases.

Homer E. Stavely, Ph.D., formerly research fellow in chemistry, Yale University, New Haven, Conn., and Harold B. MacPhillamy, a graduate student in the department of organic chemistry, Columbia University, New York, to the division of organic chemistry.

Sybille Tolksdorf, recently engaged in research at the Institute of Experimental Biology, University of California, associate in the biochemical laboratory.

Frank H. Bergeim and David F. Menard, Ph.D., members of the Squibb staff, associate and assistant respectively in the laboratory of medicinal chemistry.

Stefan Ansbacher, D.Sc., of the Squibb staff since 1937, associate in the division of experimental medicine.

The division of experimental medicine is working out a plan of hospital affiliation to provide clinical facilities. A ward of fifteen or twenty beds will be maintained for the observation of patients in connection with research problems at the institute. Under the direction of this division, new fellowships in medical schools will be established and existing fellowships will be continued as part of the institute's program. Dr. Harrop, a native of Illinois, graduated in 1916 from Johns Hopkins' medical school and was a member of the faculty from 1924 to 1937. The new laboratory building will be dedicated early in October.

Indianapolis Cancer Clinic

The city of Indianapolis was formally presented August 18 with the new cancer clinic at the city hospital known as Patrick Hall. Edwin L. Patrick, Indianapolis business man, made the presentation; Mayor Walter C. Boetcher accepted the clinic, in turn presenting it to Dr. George W. Kohlstaedt, president of the city board of health. The cancer clinic is the gift of the late Mrs. Kathryn Cones Patrick, who in leaving a $100,000 benefaction fund stipulated that her husband was to select the recipient. The new department, which offers complete equipment for the treatment of cancer, will be maintained from the income of a fund of $60,000; $40,000 of the original sum was used for equipment.

◆ ◆

Nemours Foundation for Crippled Children

Construction will begin in October on a new 100 bed hospital for crippled children within the Nemours Estate near Wilmington under the auspices of the Nemours Foundation for Crippled Children. Children up to the age of 16 years will be admitted to the hospital but may be kept for educational purposes to an older age if necessary.

A medical advisory board was appointed consisting of the following members:

Dr. Thomas R. Brown, associate professor of medicine, Johns Hopkins University School of Medicine, Baltimore, chairman; Dr. Robert B. Osgood, John B. and Buckminster Brown, professor emeritus of orthopedic surgery, Harvard University Medical School, Boston, secretary; Dr. Philip D. Wilson, clinical professor of orthopedic surgery, Columbia University College of Physicians and Surgeons, New York; Dr. George E. Bennet, associate professor of orthopedic surgery at Johns Hopkins; Dr. DeWitt B. Casler, associate in gynecology at Johns Hopkins; Dr. William T. Graham, professor of orthopedic surgery, Medical College of Virginia, Richmond; Dr. Beverley R. Tucker, emeritus professor of neuropsychiatry, Medical College of Virginia, Richmond; Dr. Michael Hoke, Beaufort, S. C., formerly chief surgeon at Warm Springs Foundation, Warm Springs, Ga.

Dr. Alfred R. Sands, Jr., formerly associate professor of surgery in charge of orthopedics, Duke University School of Medicine, Durham, N. C., was appointed medical director of the foundation in June, 1937.

A four point program has been adopted by the advisory board: medical care of the crippled child, which begins with the construction of the new hospital; education of the crippled child; research on problems relating to the crippled child, and graduate instruction for persons interested in this field.

◆ ◆

Elise A. Lake Foundation

The Lake Foundation has been organized within the past year to cooperate with the free cancer clinic of the University of Arkansas School of Medicine, Little Rock. The foundation is sponsored by the Arkansas Federation of Women's Clubs and is named in honor of the late Mrs. Elise A. Lake, Hot Springs, a past president of the federation, who for a year or more before her death was active in a statewide educational campaign for the early diagnosis of cancer. Its object "shall be mutual counsel and helpfulness in uniting the influence and service of citizens of the state, in promoting education for early diagnosis and treatment of cancer and to raise funds for the Elise A. Lake Foundation to increase facilities for diagnosis and treatment of cancer," at the university cancer clinic. The foundation is now seeking funds to carry out its work and county units are being organized. At a dinner during the biennial convention of the federation of women's clubs in May, pledges and cash amounting to about $1,200 were received. Mr. Lake, who was named honorary chairman, had previously given

the foundation its first pledge of $1,000. Mrs. John F. Weinmann, Little Rock, is chairman. The late Dr. Harvey Thatcher, professor of pathology at the university medical school, was active in the organization of the foundation, and his successor, Dr. Albert F. De Groat, is now vice chairman. Physicians on the advisory council are Drs. Frank Vinsonhaler, dean of the medical school; Joy K. Donaldson, associate professor of surgery, and William B. Grayson, Little Rock, state health officer.

◆ ◆

Mayo Foundation House Dedicated

The residence of Dr. and Mrs William J. Mayo, Rochester, was dedicated September 23 "as a meeting place where men of medicine may exchange ideas for the good of mankind." The residence, now known as the Mayo Foundation House, and the east half of the block on which it stands was deeded about a year ago to the Foundation together with sufficient endowment for its maintenance. The activities carried on there will be for medical education in its broadest sense and particularly with the view of fulfilling the purposes of the Mayo Foundation for Medical Education and Research.

◆ ◆

State of Alabama Department of Public Health

The next examination for the licensure of applicants to practice medicine in Alabama will be held by the State Board of Medical Examiners in Montgomery, January 3-5, 1939.

◆ ◆

Iowa Board Requires Citizenship of Foreign Graduates

The State Board of Medical Examiners recently adopted a resolution requiring all applicants to practice medicine in Iowa coming from foreign medical colleges, exclusive of Canada, to furnish certified evidence that they have full citizenship in the United States.

Book News

The Principles and Practice of Medicine

Originally written by the late Sir William Osler; four editions revised by the late Dr. Thomas McCrae; this, the 13th edition, revised by Henry A. Christian, M.D., Hersey Professor of the Theory and Practice of Physic, Harvard University; Physician-in-Chief, Peter Bent Brigham Hospital, Boston, Massachusetts. 13th Ed. D. Appleton-Century Company, New York. 1938.

This book is too well known, and deservedly so, to be made the subject of criticism. During the life of the original author, Dr. Osler, it was regarded as the last word in textbooks on clinical medicine. Dr. McCrae, a pupil and assistant of Osler, followed carefully and well in the footsteps of his master, and now, another of Osler's pupils, Dr. Christian, has taken on the work so well done by the late Dr. McCrae, and his revision of the master's book brings it up-to-date so far as newer knowledge is concerned without destroying or even disturbing the spirit of the original. This text remains a masterpiece after more than thirty-six years of splendid service.

◆ ◆

Textbook of Histology

By E. V. Cowdry, Professor of Cytology, School of Medicine, Washington University, St. Louis. 2d Ed. Lea & Febiger, Philadelphia. 1938. Price, $7.

In preparing the second edition of this work, the author has provided an introduction that is partly historical and at the same time is intended to orient the students in their further study, which brings the book within the range of those students who enjoy less preliminary training than the majority of those who go to medical school. Many new figures have been added to illustrate more fully normal variations in structure upon which depend degrees of physiological activity. The text has been expanded by nearly a hundred pages and many new illustrations have been added.

The book has been made easier to use as a laboratory guide by bridging the gap between gross and microscopic anatomy. "The most effective aid to laboratory work is, as far as possible, to examine each organ first in the gross and then with hand lenses, to try to tease it apart with dissecting needles, to examine the pieces in the fresh condition with the microscope and finally to study tissue prepared by the best techniques available. This method of approach, supplemented by the performance of simple experiments, gives the students something to do and relieves them from the deadly monotony of peering hour after hour through a microscope." The presentation of the subject differs from the one usually employed. The central theme is the blood vascular system as the great integrator. The objective is that students shall visualize the reactivity of the minute structure of the human body in terms of biochemistry, physiology, and pathology. The book is no ordinary compilation but rather a mine of authoritative, up to date information and interpretation.

◆ ◆

Diagnostic Roentgenology

Edited by Ross Golden, M.D., Professor of Radiology, Columbia University, New York. Thomas Nelson and Sons. 1938. Price, $4.50.

These are the renewal pages for the Nelson Loose Leaf Diagnostic Roentgenology—255 pages of text and 230 new illustrations; three new chapters on "Dental Roentgenology," "Soft Tissues of the Air and Food Passages of the Neck," and "The Abdomen."

INDEX FOR VOLUME 13

A

Abstracts of current literature, 156 (Mar.); 221 (May); 284 (July); 346 (Sept.).
Accomplishment, student, study of (Zapffe), 130 (Mar.)
Accreditation on basis of knowledge, not credits, at Columbia University, 60 (Jan.).
Alabama State Department of Health examination for licensure, 409 (Nov.).
Alpha Epsilon Delta fraternity convention, 154 (Mar.), 220 (May).
Anesthesiology, Board of, 282 (July).
Applicants to 1937 freshman class of 78 medical schools in U. S., study of (Zapffe), 196 (May).
Aptitude test, medical for medical schools, report of committee on (Moss), 177 (May).
Army Medical Library and Museum, 271 (July).
Arthritis, chronic, Bryn Mawr Fund for investigation of, 283 (July).
Association of American Colleges, annual meeting, 60 (Jan.).
Association of American Medical Colleges: Officers for 1937-1938, 45 (Jan.); for 1938-1939, 397 (Nov.).
Association of American Medical Colleges, organization of (Zapffe), 38 (Jan.); first graded curriculum (Zapffe), 392 (Nov.).
Association of American Medical Colleges: Teacher Placement Bureau, 46 (Jan.).
Association of Medical Students, 153 (Mar.).

B

Bacteriology, Frederick G. Novy fellowship fund for research in, 152 (Mar.).
Barnett, Geo. D.: Introductory course in clinical medicine, 225 (July).
Black, B. W.: Community aspects of medicine, 19 (Jan.).
Books, new, 61 (Jan.); 158 (Mar.); 223 (May); 285 (July); 349 (Sept.); 410 (Nov.).
British Postgraduate Medical School, course in clinical pathology, 345 (Sept.).
Britt, Robert E.: The fundamentals of psychiatry as applied to medical education, 353 (Nov.).
Bruckman, F. S.: Correlation between the outpatient clinic and the senior curriculum, 243 (July).
Bryn Mawr Fund for investigation of chronic arthritis, 283 (July).

C

California Society for the Promotion of Medical Research, 155 (Mar.).
Canadian medical students organize, 345 (Sept.).
Cancer, Patterson Research Institute, 59 (Jan.). research in Omaha, 152 (Mar.).
  study of (Wm. H. Donner endowment 57 (Jan.).
Capps, Joseph A., 57 (Jan.).
Carey Eben J.; medical society award, 399 (Nov.).
Chemical psychiatry: poem, 394 (Nov.).
Chicago Tumor Institute, 219 (May).
Child neurology research, 219 (May).
Citizenship for licensure, 395, 406 (Nov.).
Commonwealth Fund aids graduate education, 219 (May); 406 (Nov.).
  annual report for 1937, 153 (Mar.).
Conference, educational, 269 (July).
Congress on medical education, 145 (Mar.).
Couch, R.: Community aspects of medicine, 25 (Jan.).
Council, National, on Medical Education, Licensure and Hospitals, Need for (Rappleye), 289 (Sept.).
Curriculum, first graded (Zapffe), 392 (Nov.).
  medical, cultivation of health in relation to (Ryerson), 7 (Jan.).
  senior, at University of California Medical School (Lucia), 236 (July).
  senior, correlation between—and outpatient department. (Bruckman), 243 (July).

D

Data on graduation class of 1937, 143 (Mar.).
Davis, J. E.: Some desirable changes in the outline content of the undergraduate program in pathology, 33 (Jan.).
DeGaris, Chas F.: The autonomic nervous system; morphologic and functional considerations for the medical student, 363 (Nov.).
Dobbie, R. P.: A superior written examination (objective type) as applied in the medical school 85 (Mar.).
Dock, Wm.: Teaching of pathology, 231 (July).
Douglas, Beverly: Predictive value of the medical aptitude test at Vanderbilt University School of Medicine, 380 (Nov.).
Diehl, H. S.: The Minnesota Comprehensive examination plan, 71 (Mar.).
Diogenes, experiences of, 44 (Jan.).

E

Ebaugh, Franklin G. and Rees, M. H.: The personality study as an aid in teaching psychobiology, 170 (May).
Economics, medical, teaching of to undergraduate medical students (Roberts-Davis), 359 (Nov.).
Editorials, 44 (Jan.); 143 (Mar.); 213 (May); 269 (July); 337 (Sept.); 395 (Nov.).
Education, medical, and health (Ryerson), 1 (Jan.).
  medical, as discussed in "American Medicine" (Lape), 295 (Sept.).
  medical, early; historical statement, 338 (Sept.).
  medical, fundamentals of psychiatry as applied to (Britt), 353 (Nov.).
  medical, history; first graded curriculum (Zapffe), 392 (Nov.).
  medical, problems of, 58 (Jan.).
  of 1937-1938 freshman class, 143 (Mar.).
Elizabeth Clay Howard scholarship, 60 (Jan.).

Examination, comprehensive plan, at Minnesota (Diehl), 71 (Mar.).
or Examiner (MacEwen), 65 (Mar.).
superior written (objective type) as applied in medical school (Dobbie), 85 (Mar.).
Examinations at Oregon (Sears), 79 (Mar.).
symposium on, 65 (Mar.).

F

Fellowship: Frederick G Novy for bacteriologic research, 152 (Mar.).
graduate, Commonwealth Fund, 219 (May).
in psychiatry, 57 (Jan.).
University of Geneva, 152 (Mar.).
University of Kiel, 59 (Jan.).
Fellowships, Mary Putnam Jacobi, 56 (Jan.).
Ross V. Patterson, 283 (July).
Finney-Howell Research Foundation, 56 (Jan.); 345 (Sept.).
Foundation, Elise A. Lake, 408 (Nov.).
Finney-Howell Research, 56 (Jan.); 345 (Sept.).
Hecksher for children, 152 (Mar.).
Judson Daland for research in medicine, 57 (Jan.).
Louis and Henrietta Blaustein, 57 (Jan.).
Nemours, for Crippled Children, 409 (Nov.).
Wollman, 406 (Nov.).
Zachary Smith-Reynolds to combat syphilis, 155 (Mar.).
Fund, Bryn Mawr, for investigation of chronic arthritis, 283 (July).

G

German medical schools, summer courses for foreigners, 220 (May).
student exchange, 144 (Mar.).
Graduates of 1937, data on, 143 (Mar.).
Greek and Latin, value of in education, 213 (May).

H

Hardman cup to Dr. Sydenstricker, 345 (Sept.).
Health and medical education (Ryerson), 1 (Jan.).
cultivation of in relation to medical curriculum (Ryerson), 7 (Jan.).
officers, qualifications and preparation of, 284 (July).
Heckscher Foundation for children, 152 (Mar.).
Hertzstein lectures, 220 (May).
Hospital administration, a specialty, 270 (July).
data, 214 (May).
Hygiene, social, day, 58 (Jan.).

I

Indiana Board ruling on foreign graduates, 283 (July).
Indianapolis Cancer Clinic, 408 (Nov.).
Institute of International Education, 219 (May).
International Academy of Postgraduate medicine, 283 (July).
Congress on Comparative Pathology, 407 (Nov.).
Internships in German hospitals for American graduates, 213 (May).
Iowa Board Requires Citizenship for foreign graduates, 409 (Nov.).

J

Johnson, Geo. S.: Integration of the teaching of psychology and psychiatry, 161 (May).
Joseph A. Capps Prize awarded, 345 (Sept.).
Judson Deland Foundation for research in medicine, 57 (Jan.).

K

Knowledge vs. credits, 60 (Jan.).

L

Lake, Elise A., Foundation, 408 (Nov.).
Lape, E. E.: Medical Education as discussed in "American Medicine," 295 (Sept.).
Latin and Greek, value of in education, 213 (May).
Lectures vs "Doing," 346 (Sept.).
Lettenberger, J.: Teaching methods in medicine, or how effective is our teaching, 264 (July).
Licensure, analysis of 1937 statistics, 346 (Sept.).
citizenship for, 395, 406 (Nov.).
statistics for 1937, 269 (July).
Louis and Henrietta Blaustein Foundation, 57 (Jan.).
Lucia, S. P.: Organization of the senior curriculum at the University of California Medical School, 236 (July).

M

MacEwen, E. M.: Examination or Examiner, 65 (Mar.).
Marquette University ruling anent society membership of medical faculty, 399 (Nov.).
Mary Putnam Jacobi Fellowship, 56 (Jan.).
Mayo Foundation House dedicated, 409 (Nov.).
McGuigan, H. A.: Experiences of Diogenes, 44 (Jan.).
Medicine, clinical, introductory course in (Barnett), 225 (July).
community aspects of (Black), 19 (Jan.).
community aspects of (Wahl), 14 (Jan.); (Couch), 25 (Jan.).
environmental; medical sociology, 45 (Jan.).
preventive, training of medical students in (Munson-Schmitt), 325 (Sept.).
social, in medical school in Paris, 58 (Jan.).
study of, at Cornell University Medical College (Opie), 190 (May).
Meeting, annual, 1938, 334 (Program); 338 (Sept.)
Middleton, W. S.; medical society award, 399 (Nov.).

Minnesota comprehensive examination plan (Diehl), 71 (Mar.).
Moon, G. R.: Study of premedical and medical scholastic records of students in University of Illinois College of Medicine, 208 (May).
Moss, F. A.: Report of Committee on Aptitude Tests for Medical Schools, 177 (May).
Munson, E. L. and Schmitt, L. S.: On the training of medical students in preventive medicine, 325 (Sept.).

N

National Council on Medical Education, Licensure and Hospitals, 337 (Sept.).
Nelson, E. S.: Course in practical nutrition for medical students, 41 (Jan.).
Nemours Foundation for Crippled Children 408 (Nov.).
Nervouse system, autonomic; morphologic and functional considerations for the medical student (DeGaris), 363 (Nov.).
Neurosurgery, Rockefeller Foundation endows chair, 282 (July).
News, book, 61 (Jan.); 158 (Mar.); 223 (May); 285 (July); 349 (Sept.); 410 (Nov.).
college, 49 (Jan.); 147 (Mar.); 215 (May); 273 (July); 340 (Sept); 401 (Nov.).
general, 56 (Jan.); 152 (Mar.); 219 (May); 282 (July); 345 (Sept.); 406 (Nov.).
Novy, Frederick G., fellowship fund for research in bacteriology, 152 (Mar.).
Nutrition, course in practical for medical students (Nelson), 41 (Jan.).

O

Opie, E. L.: Study of medicine at Cornell University Medical College, 190 (May).
Oregon, University, plan of promotion in first two years (Sears), 79 (Mar.).
Outpatient clinic and senior curriculum, correlation between (Bruckman), 243 (July).

P

Pathology, some desirable changes in the outline content of the undergraduate program in (Davis), 33 (Jan.).
teaching of (Dock), 231 (July).
Patterson Institute of Cancer Research, 59 (Jan.).
Patterson, Ross V., 268 (July); fellowships, 283 (July).
Physician, from medical graduate to (Wakerlin), 259 (July).
Physicians, distribution of, 395 (Nov.).
Physiologist for Guatemala, 214 (May).
Physiology, special course at University of Chicago, 396 (Nov.).
Prevention of disease in 1893, 145 (Mar.).
Prizes: Alvarenga for 1938, 153 (Mar.).
Joseph A Capps, 57 (Jan.).
Mississippi Valley medical Society, 56 (Jan.).
William F. Snow medal for distinguished service in social hygiene, 152 (Mar.).
Program, Association, for 1938 meeting, 334.
Psychiatry, fellowships in, 57 (Jan.).
fundamentals of, as applied to medical education (Britt), 353 (Nov.).
graduate training in, 406 (Nov.).
scholarship in, 220 (May).
Psychobiology, personality study as aid in teaching (Ebaugh-Rees), 170 (May).
Psychology and psychiatry, intergration of teaching of (Johnson), 161 (May).
and psychiatry, integration of teaching of (Stone), 164 (May).
Public speaking: course in at Indiana University School of Medicine, 46 (Jan.).

R

Rappleye, W. C.: The Need of a National Council on Medical Education, Licensure and Hospitals, 289 (Sept.).
Rees, M. H. and Ebaugh F. G.: The personality study as an aid in teaching psychobiology, 170 (May).
Reichert, F. L.: Introductory course in surgery, 228 (July).
"Repeaters," 339 (Sept.).
Research, medical, in Canada, 345 (Sept.).
Reynolds, Zachary Smith, Foundation to combat syphilis, 155 (Mar.).
Roberts, Kingsley, and Davis, Michael: Teaching of medical economics to undergraduate medical students, 359 (Nov.).
Royster, H. A.: Banishment of minor surgery, 247 (July).
Ryerson, E. S.: Cultivation of health in relation to medical curriculum, 7 (Jan.).
Health and medical education, 1 (Jan.).

S

Scholarship in arts college and medical freshman year, correlation of (Zapffe), 331 (Sept.).
premedical and medical of University of Illinois College of Medicine, comparative (Moon), 208 (May).
Scholarships: Elizabeth Clay Howard, 60 (Jan.).
in psychiatry, 220 (May).
Scrappines, danger of, 156 (Mar.).
Sears, H. J.: Plan for promotions in the first two years at University of Oregon Medical School, 79 (Mar.).
Signs of spring, 235 (July).
Snow, Wm. F., medal for distinguished service in social hygiene, 152 (Mar.).
Sociology, medical: environmental medicine, 45 (Jan.).
Squibb Institute for Medical Research, 408 (Nov.).
Statistics, vital, what the medical student should be taught about, 221 (May).
Stone, Calvin P.: Integration of the teaching of psychology and psychiatry, 164 (May).
Student exchange, foreign, 47 (Jan.); 213, 214 (May).
freshman medical, in 1937-1938, 47 (Jan.).
Surgery, introductory course in (Reichert), 228 (July).
minor, banishment of (Royster), 247 (July).
Syphilis, Reynolds Foundation to combat, 155 (Mar.).
Syracuse meeting, 398 (Nov.).

T

Tadpole, meditation of a, 142 (Mar.).

Teacher Placement Bureau, A.A.M.C., 46 (Jan.); 272 (July); 339 (Sept.).

Teachers of professorial rank in U. S. medical colleges, 272 (July).

Teaching, how effective is our (Lettenberger), 264 (July).

of pathology (Dock), 231 (July).

of preventive medicine to medical students (Munson-Schmitt), 325 (Sept.).

psychobiology, personality study as aid in (Ebaugh-Rees), 170 (May).

of psychology and psychiatry, integration of (Johnson), 161 (May); (Stone), 164 (May).

Tests, medical aptitude, predictive value of at Vanderbilt University School of Medicine (Douglas), 380 (Nov.).

medical aptitude, report of committee (Moss), 177 (May).

Therapeutics up to date, 144 (Mar.).

Therapy, physical, residency in, 153 (Mar.).

Tumor Institute, Chicago, 219 (May).

U

University of Geneva fellowship in medicine, 152 (Mar.).

University of Kiel fellowships, 59 (Jan.).

W

Wahl, H. R.: Community aspects of medicine, 14 (Jan.).

Wakerlin, Geo. E.: from medical graduate to physician, 259 (July).

Wollman Foundation, 406 (Nov.).

Z

Zapffe, Fred C.: Association of American Medical Colleges (organization), 38 (Jan.).

Correlation of scholarship in the arts college with scholarship in the freshman year in medical school, 331 (Sept.).

History of medical education; first graded curriculum, 391 (Nov.).

Study of accomplishment of 1936 freshman class in 78 medical colleges in United States and 8 medical colleges in Canada, 130 (Mar.).

Study of applicants for admission to 1937 freshman class of 78 medical colleges in the U.S., 196 (May).

Massachusetts

Boston University School of Medicine, Boston.
Harvard Medical School, Boston.
Tufts College Medical School, Boston.

Michigan

University of Michigan Medical School, Ann Arbor.
Wayne University College of Medicine, Detroit.

Minnesota

University of Minnesota Medical School, Minneapolis.
University of Minnesota Graduate School, Medical Department (Mayo Foundation), Minneapolis and Rochester.

Mississippi

University of Mississippi School of Medicine, University.

Missouri

St. Louis University School of Medicine, St. Louis.
University of Missouri School of Medicine, Columbia.
Washington University School of Medicine, St. Louis.

Nebraska

Creighton University School of Medicine, Omaha.
University of Nebraska College of Medicine, Omaha.

New Hampshire

Dartmouth Medical School, Hanover.

New York

Albany Medical College, Albany.
Columbia University College of Physicians and Surgeons and New York Post Graduate Medical School, New York.
Cornell University Medical College, New York.
Long Island College of Medicine, Brooklyn.
New York Medical College and Flower Hospital, New York.
New York University College of Medicine, New York.
Syracuse University College of Medicine, Syracuse.
University of Buffalo School of Medicine, Buffalo.
University of Rochester School of Medicine, Rochester.

North Carolina

Duke University School of Medicine, Durham.
University of North Carolina School of Medicine, Chapel Hill.
Wake Forest College School of Medicine, Wake Forest.

Ohio

Ohio State University College of Medicine, Columbus.
University of Cincinnati College of Medicine, Cincinnati.
Western Reserve University School of Medicine, Cleveland.

Oklahoma

University of Oklahoma School of Medicine, Oklahoma City.

Oregon

University of Oregon Medical School, Portland.

Pennsylvania

Hahnemann Medical College and Hospital, Philadelphia.
Jefferson Medical College of Philadelphia.
Temple University School of Medicine, Philadelphia.
University of Pennsylvania School of Medicine and Graduate School of Medicine, Philadelphia.
University of Pittsburgh School of Medicine, Pittsburgh.
Woman's Medical College of Pennsylvania, Philadelphia.

Philippine Islands

University of the Philippines College of Medicine, Manila.

South Carolina

Medical College of the State of South Carolina, Charleston.

South Dakota

University of South Dakota School of Medicine, Vermillion.

Tennessee

Meharry Medical College, Nashville.
University of Tennessee College of Medicine, Memphis.
Vanderbilt University School of Medicine, Nashville.

Texas

Baylor University College of Medicine, Dallas.
University of Texas Department of Medicine, Galveston.

Utah

University of Utah School of Medicine, Salt Lake City.

Vermont

University of Vermont College of Medicine, Burlington.

Virginia

Medical College of Virginia, Richmond.
University of Virginia Department of Medicine, Charlottesville.

West Virginia

West Virginia University School of Medicine, Morgantown.

Wisconsin

Marquette University School of Medicine, Milwaukee.
University of Wisconsin Medical School, Madison.

MACMILLAN

FUNDAMENTALS OF DENTISTRY IN MEDICINE

by John Oppie McCall, D.D.S., F.A.C.D., Director, the Murray and Leonie Guggenheim Dental Clinic, New York City; Consultant in Dentistry, the New York Hospital; with a foreword by Wilson G. Smillie, M.D.

In recent years, growing recognition of the interrelationship of dental and general health has made the basic principles of dentistry a desirable part of every physician's knowledge. The general practitioner, as well as the public health officer, must now be informed in this field.

Dr. McCall meets this new need by presenting the teeth as an integral part of the body. Avoiding the techniques of the specialist, he gives in compact form the fundamental information which should be available to every medical student.

Probably $2.75

TO BE PUBLISHED IN JANUARY

IMMUNITY

Principles and Application In Medicine and Public Health

by Hans Zinsser, M.D., John F. Enders, Ph.D., and LeRoy D. Fothergill, M.D.

Fifth Edition of "Resistance to Infectious Diseases"

While retaining much of its original character, this new edition will meet the need for increased correlation between laboratory findings and their practical application.

Probably $6.50

MEDICAL ENTOMOLOGY

by Professor William B. Herms

Third Edition of "Medical and Veterinary Entomology"

Dr. Herms book has been rewritten for the use of the medical profession, and will include a large number of fine illustrations. Of especial interest to public health workers.

Probably $5.50

THE MACMILLAN COMPANY

60 FIFTH AVENUE NEW YORK, N. Y.

Boston Chicago San Francisco Dallas Atlanta